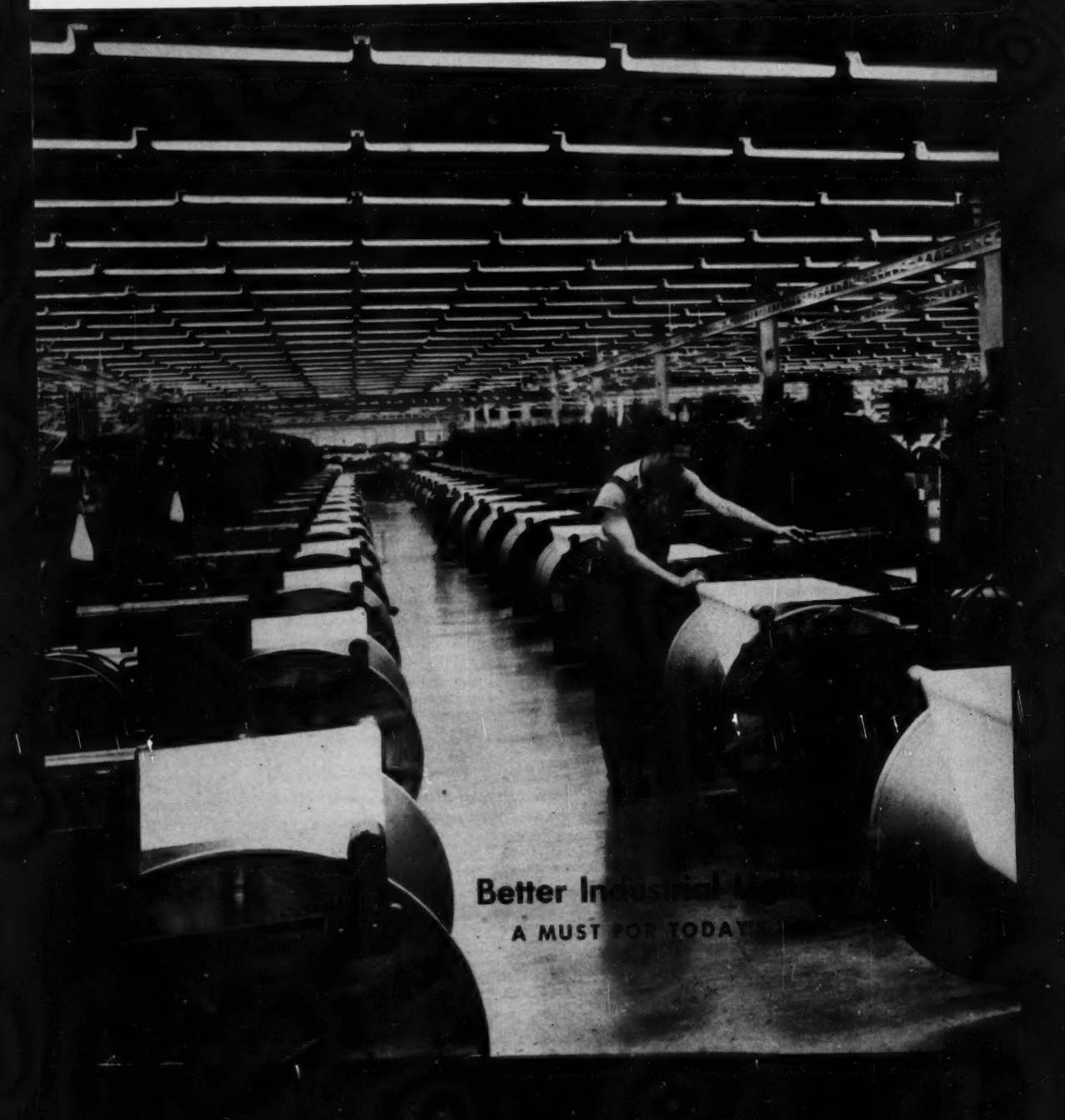
AUGUST 13, 1951

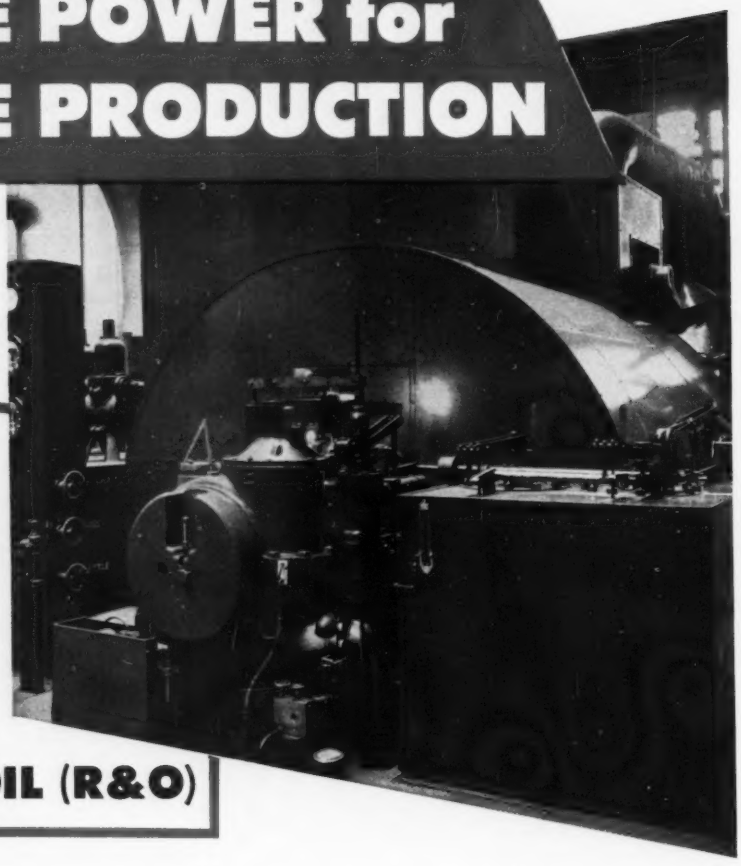
Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



MORE POWER for MORE PRODUCTION



Keep turbines "on the line" with TEXACO REGAL OIL (R&O)

Complete freedom from rust, foam and harmful sludge – you can count on that when you lubricate your turbines with *Texaco Regal Oil (R&O)*. It's your best assurance of more power production.

Texaco Regal Oils (R&O) were originally Texaco Regal Oils, famous around the world as turbine lubricants. Today, improved with special additives and processing, they are *more than ten times as resistant to oxidation* and their ability to protect against rust and foam has been vastly increased.

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A Texaco Lubrication Engineer will gladly help you improve performance of all your power plant machinery. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

STEAM COSTS

Steam generation men will probably say that the 7th Steam Station Cost Survey, coming in the next regular issue, is the most significant study in this series.

Some 80 new stations have gone into operation since Electrical World made its 6th Steam Station Cost Survey last July, and these new stations reflect the impact of sharply increased costs of labor, fuel, and construction.

With more than 27 million kw of new generating capacity scheduled for construction by the end of 1954, the industry needs every guidepost it can find, as an index for the generating plants that are coming—plants that will supply power for the defense economy.

And the best set of guideposts we can imagine is in the 7th Steam Station Cost Survey.

In preparing his questionnaire, Electrical World's Senior Associate Editor Arch Knowlton followed a philosophy laid down long ago. It is the biggest single reason that generating men anticipate these studies so keenly, and why they are willing to do the work necessary to fill out the involved and lengthy questionnaire.

Knowlton's philosophy is best expressed in the letter he sent out: "We enclose a questionnaire which is aimed at eliciting and compiling the essential design and operating factors so that the costs can be interpreted in the light of the design objectives."

Or, as Arch Knowlton has been known to say a little more cogently: "We're interested in why rather than what, when, where, and how much."

IN OR OUT?

The Quebec hydro-electric commission's new Delorimier substation is unusual in several ways: It is an oil-less indoor substation, with a 120-kv indoor switchyard, dry-type tap-changing feeder regulator and unconventional style of construction.

But the most interesting thing about it to distribution men is the fact that it sets forth the economics of indoor versus outdoor, for the first time that we know of. Do you save enough, through protecting high-priced equipment from the weather, and reducing maintenance expense, to pay for a building to cover a substation?

That's an intriguing question. It gets an interesting answer in the affirmative in the next regular issue.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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MODERN CABLE DESIGN CAN SAVE YOU MONEY...

But be sure it's been proved too

There have been a lot of new ideas in cable materials and methods over the years—some good, some bad. New ideas often have limitations as well as advantages. The cable which has the *best balance* between the modern and the time-tested, is your best buy.

With Okonite, you can be sure it's modern—and be sure it's *field-proved*, too. For Okonite has constantly maintained the initiative in introducing techniques and materials to the electrical cable industry. Okonite's ultra-modern research facilities are ever abreast of the newest developments, and in 72 years have pioneered countless technological improvements.

But Okonite does not—*will* not—offer a new idea to you until its worth has been proved beyond all question. A new development must survive months . . . and years . . . of every conceivable type of testing before it is built into any Okonite cable.

These are some of the "firsts" which have successfully weathered Okonite's proving ground tests, and the ultimate test of prolonged usage. And, what's more important, these developments have given you cables of greater reliability and wider application to meet the complex and ever-increasing needs of the electrical industry.

FIRST—to introduce rubber-insulated power cable for 35,000-volt service (Okolite)

FIRST—to produce American shock-proof, high voltage rubber-insulated x-ray cables (Okolite)

FIRST—to use neoprene in cable sheathing (Okoprene)

FIRST—to develop (Okoseal) synthetic impervious sheath (PVC) for Navy shipboard cables, now used by the industry in many types of wire

FIRST—to use glass as a wire insulation—quickly adapted by electric motor manufacturers for magnet wire (Okoglass)

FIRST—to introduce high-pressure pipe type cable system for high voltage transmission circuits (Oilostatic)

FIRST—to use semi-conducting tape between conductor and insulation to prevent internal corona-cutting (Semicon Tape)

FIRST—to develop "line-tap" reverse-lay self-supporting aerial cable (Dualay)

FIRST—to introduce all-rubber underground cable (Okosheath)

FIRST—to introduce small diameter building wire to solve problem of rewiring raceways (Okoseal)

When you have a cable problem, ask your Okonite representative to help you choose the most effective cable to meet the job requirement or write directly to The Okonite Company, Passaic, N. J.

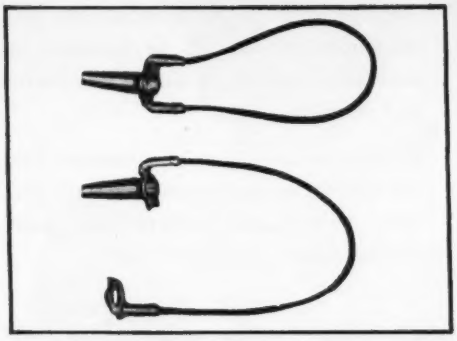
THE BEST CABLE IS YOUR BEST POLICY

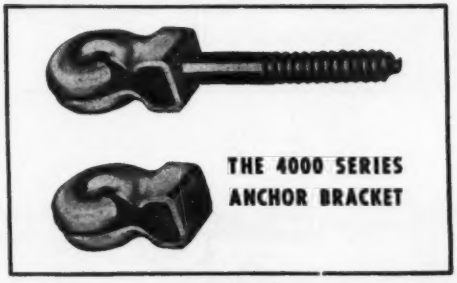
OKONITE SINCE 1878 *insulated wires and cables*

8488

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable





This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

WRITE FOR NEW BULLETINS FOR FULL INFORMATION

Electroline Company

[illegible] South La Salle Street • Chicago 9, Illinois

NEW LOW COST

BREAKS ANY CHARGING CURRENT AND

THE TIME-TESTED ALDUTI INTERRUPTER SWITCH AT CONVENTIONAL AIR BREAK SWITCH PRICES

Since 1939 the reliability of the solid-material confined-arc extinction method of high voltage circuit interruption illustrated below has been proved under actual service conditions in thousands of installations for switching full rated load currents, line- and cable-charging currents, and magnetizing currents.

This circuit interrupting principle is now available in group-operated arrangements for pole-top switching at prices that compare with horn gap switches.

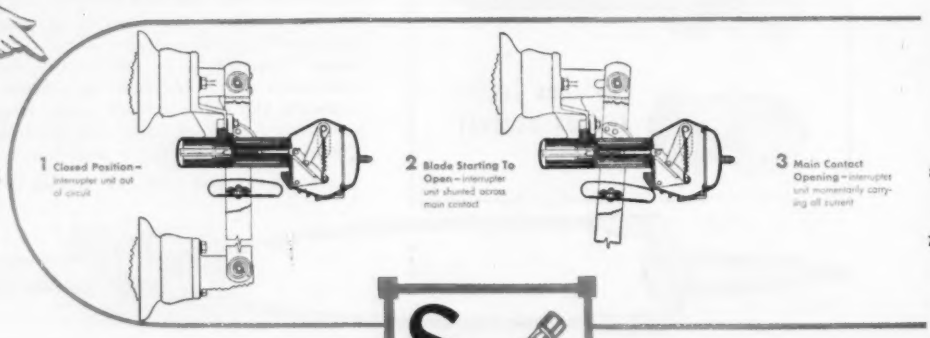
Because there is no external arc, this interrupter switch can be inverted, or mounted vertically, for simple installation and maintenance.

Further, because there is no external arc, the cost-saving side-opening design pictured here actually requires less phase spacing than a horn gap switch.

• • •

Full details are available from your local S&C representative, or the factory.

HERE'S HOW THE ALDUTI INTERRUPTER UNIT OPERATES TO PROVIDE CONFINED-ARC SWITCHING


1 Closed Position – interrupter unit out of circuit
2 Blade Starting To Open – interrupter unit shunted across main contact
3 Main Contact Opening – interrupter unit momentarily carrying all current

S&C ELECTRIC

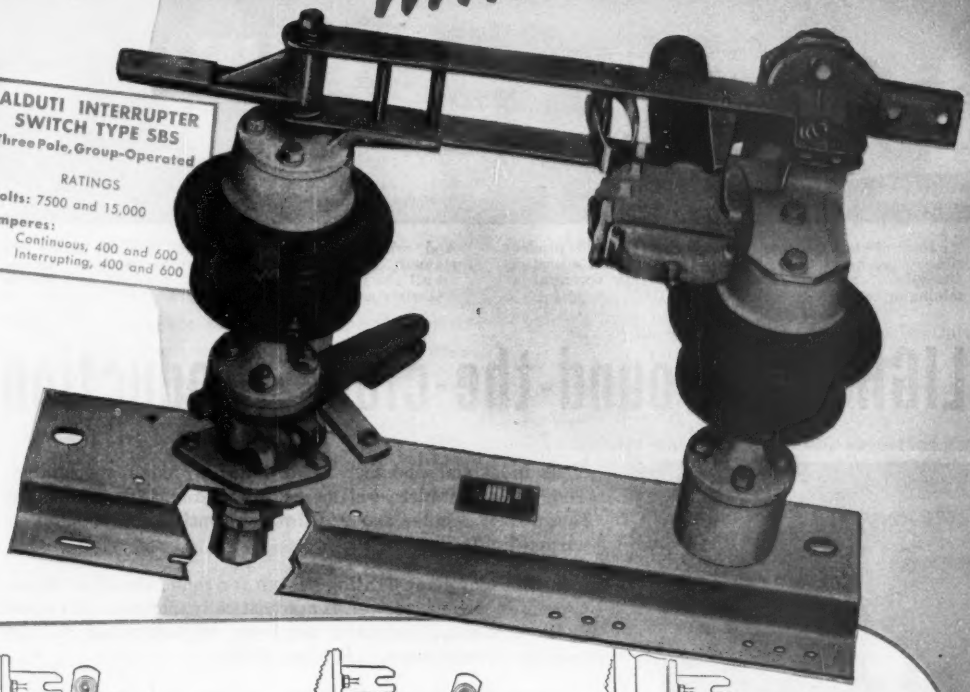
Formerly SCHWEITZER & CONRAD, INC.

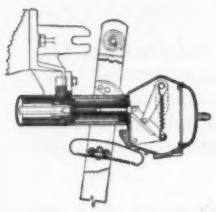
POLE TOP SWITCH

FULL LOAD CURRENT *WITHOUT ARCING!*

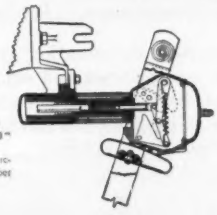
ALDUTI INTERRUPTER SWITCH TYPE SBS
Three Pole, Group-Operated

RATINGS
Volts: 7500 and 15,000
Amperes:
Continuous, 400 and 600
Interrupting, 400 and 600

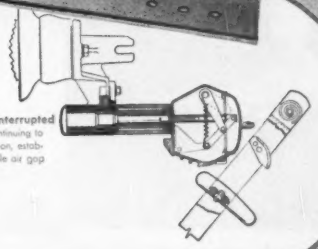




4 **Interrupter Unit Contacts Parting**—current being interrupted within arc-extinguishing chamber



5 **Current Interrupted**—blade continuing to open position, establishing visible air gap



COMPANY

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

In Canada, Electric Controller & Manufacturing Powerlite Devices, Limited, Toronto

An efficient plant lighting system such as this adds production during night time hours to daytime plant operating schedules . . . permits increased production potential at minimum cost.

And, when plant lighting jobs of similar nature are planned, Graybar offers convenient "single order" service on all the lighting units, lamps, conduit, and wiring materials required.

LIGHT for round-the-clock production

Offices, schools, and commercial buildings need sight-saving lighting, too. They'll appreciate the way their nearby Graybar office provides efficient service and scheduled deliveries.

Your industrial customers, today, face a dual responsibility. They must meet increased defense quotas and, at the same time, retain their regular markets through continued production of normal lines.

An efficient plant lighting system for round-the-clock operations is an obvious answer. It automatically increases plant production hours . . . improves employee efficiency and reduces spoilage even on normal daytime shifts.

Graybar—in co-operation with utilities and electrical contractors—has planned and supplied lighting systems of every type. That's why, when you back up your recommendations with Graybar as supplier, you can be sure that the light will be right for the job—the *right* unit . . . the *right* quality . . . the *right* characteristics.

Graybar Lighting Specialists will be glad to work with you in the selection of equipment for any lighting application. You can count on them to give an entirely impartial recommendation, for Graybar distributes the most complete selection of lamps and lighting units available from a single source. 186-98

GRAYBAR ELECTRIC COMPANY, INC.
***Executive Offices:* Graybar Building, New York 17, N. Y.**

You get the best of everything electrical . . . via GraybaR

IN OVER 100 PRINCIPAL CITIES

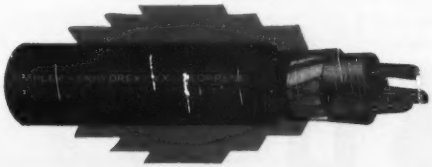
THIS WAY...

Unlike the housewife who uses bread crumbs and other materials to "stretch" the available supply of hamburger, Simplex is not able to add materials to copper to make it go further. We do achieve the same result, but by an entirely different means. Our way is to insulate the copper with Simplex-Anhydrex XX high voltage insulation. It is the very best "copper extender" that we know.

Simplex-Anhydrex XX is a product of Simplex research and development. It is an insulation that is absolutely "tops" in the high voltage field. It is designed to operate at a maximum of 167° to 176°F. (75° to 80°C.) copper temperature, depending on operating conditions. It has all the properties you want in such a high voltage rubber insulation. It will withstand heat. It also withstands ozone and aging, and it is guaranteed not to absorb more than 15 milligrams of water per square inch of exposed surface when tested in accordance with U. S. Coast Guard standards.

So far as we know it is the only insulation of its kind. Use it wherever you have a high voltage problem, whether the cables are to be installed directly in the earth, underground in ducts, under water, or overhead supported from messenger wire.

You can help to "s-t-r-e-t-c-h" the small available supply of copper by insisting that your high voltage cables be insulated with Simplex-Anhydrex XX insulation. Do you want to know more about this unique insulation? Then fill in the coupon below.



SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:

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COMPANY_____

STREET_____

CITY_____ STATE_____

"... losing friends and antagonizing people"

With her new hearing aid, Grandma Crane was really enjoying life. My it was nice to hear clearly again . . . like now, talking to her grandson at camp.

Then—silence—the hearing aid was dead! Nothing to do but go back to the office where she bought it. The technician will be in for a hard time—especially when Grandma Crane finds out that the trouble was just a bit of electrical insulation that failed.

That manufacturer saved a few pennies in costs—and lost dollars in good will.

The failure of electrical insulation in your product is a serious matter—for your customer and for you.

Leading electrical equipment and appliance manufacturers use BH "649"† Fiberglas Sleeving and Tubing to minimize the possibility of insulation breakdown.

Here is a superior, high voltage, Fiberglas insulation available in three grades—A-1, B-1 and C-1 . . . tough, abrasion resistant and permanently flexible. It is non-fogging and non-corrosive with unusual chemical resistance, except for Ketones, Esters and Aromatic Hydrocarbons. It will not crystallize at -67° F. BH "649" won't crack, peel, fray or split. It will take plenty of abuse without loss of these physical properties, or its dielectric strength even after the following tests . . . 15 minutes at 425°-450° F; 24 hours at 302° F; 1500 hours at 220°-230° F.

BH "649" is one of a family of BH insulations, each designed to meet particular conditions in service. Whether your problem is heat, cold, flexibility, abrasion, high voltage or resistance to chemicals, there is a BH insulation to help you. Give us a few facts about your requirements—products, temperatures, voltages. We will furnish samples for testing. Address Dept. W-8.

†Patent Pending

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp

L-M Protective Lighting is PRODUCTIVE Lighting

Protection is only *half* the story when you install L-M plant-protective lighting.

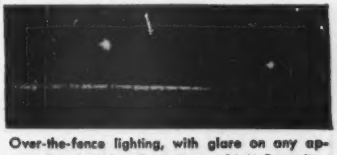
PRODUCTION, not only during the present emergency, but in the years to come, is an equally important consideration in every L-M installation.

L-M Lighting Engineers, backed by more than 35 years of experience with outdoor lighting, are designing installations which not only meet War Standards Requirements but also provide additional light on loading docks, railroad sidings, yards, storage areas, parking lots and entrances.

Dark spots are potential production-bottlenecks. They can also be scenes of lost-time accidents. By eliminating these dark areas, L-M Protective Lighting installations will continue to pay off for years to come.

No dark hideaways for intruders, even in this back alleyway. A Spherolite installation.

A lighted fence, with controlled light directed at the fence and beyond. Guards patrol roadway in semi-dark at right of picture.



Over-the-fence lighting, with glare on any approaching intruder. Typical use of L-M Fresnelite.

Two L-M Protective Lighting Units

L-M Spherolite provides 5 different light patterns. Combinations of reflectors and refractors to provide correct light pattern for almost any requirement. When equipped with L-M Autolatch, it can be serviced from ground with lamp stick; no ladder needed.

L-M Fresnelite—specially designed glare unit to provide a broad, fan-shaped light pattern. Ideal for over-the-fence lighting.

GET THIS LIGHTING BULLETIN

Ask the L-M Field Engineer for L-M's bulletin on Protective Lighting. Describes L-M Lighting Engineering Service and L-M Luminaires. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LM

LINE MATERIAL...Protective Lighting

L-M ANNOUNCES

a complete line of type PHD

5 KV HEAVY DUTY CUTOUTS

Up to 20,000 amperes interrupting capacity

Interchangeable doors—standard, heavy duty, and switch blade types

50 and 100 ampere doors fit your present PVD® cutouts.

Here is the first and only complete line of cutouts for high power capacity distribution feeders—a complete line of type PHD 5 kv cutouts in 50, 100, and 200 ampere ratings, and with interchangeable doors in each rating.

These cutouts provide high interrupting capacity *as you need it*, without the extra cost for needless high *continuous* current rating. They are guaranteed to operate through the full range of fault currents.

Now you can install one of these new L-M cutouts with standard duty doors. As feeder load requirements change and fault currents increase, just make a heavy duty cutout out of it, by hooking on the heavy duty door. Doors for the 50 and 100 ampere cutouts also fit your *present* PVD's—so you can change those into heavy duty cutouts with these new doors! Switch blade door, either stationary or indicating, converts cutout into a disconnect switch in just 6 seconds. Warehousing and stocking are all greatly simplified!

OUTSTANDING DESIGN FEATURES

- Housings wet-process porcelain, glazed inside and out.
- Hanger supports cemented into back of porcelain housings.
- All current carrying parts silver plated.
- New clamp type terminals with easily accessible large-head screws.
- Replaceable "bakelined" fuse cartridge tubes resist weathering and arcing.
- Spring-actuated flip-out device pulls fuse link down and out of tube, assuring instant separation of link parts, even with the smallest links and low fault currents.

1. standard duty door—1200 amperes interrupting capacity
2. heavy duty door—8000-5000 amperes interrupting capacity
3. switch blade door—100 amperes continuous current rating

L-M HEAVY DUTY CUTOUTS			
RATING	DOORS AVAILABLE	INTERRUPTING CAPACITY rms amperes 2.5 kv*	5 kv**
50 AMPERES	1. Standard duty, indicating	1,200 amp.	1,200 amp.
	2. Heavy duty, non-disconnecting	8,000 amp.	5,000 amp.
	3. Switch blade	100 amperes continuous current rating.	
100 AMPERES	4. Standard duty, indicating	3,000 amp.	3,000 amp.
	5. Heavy duty, non-disconnecting	14,000 amp.	10,000 amp.
	6. Switch blade	200 amperes continuous current rating.	
200 AMPERES	7. Heavy duty, indicating	20,000 amp.	15,000 amp.
	8. Switch blade	400 amperes continuous current rating.	

* or line-to-neutral 4160 or 4330 volts Gr. Y. ** or line-to-neutral 8330 volts Gr. Y.

Engineered for Safety

The lineman can remove the door completely, refuse and replace it, all with a switch stick. When door is open, all door parts are dead.

Get the Whole Story

Ask the L-M Field Engineer for complete information and copy of bulletin; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

PHD is a Line Material Trademark

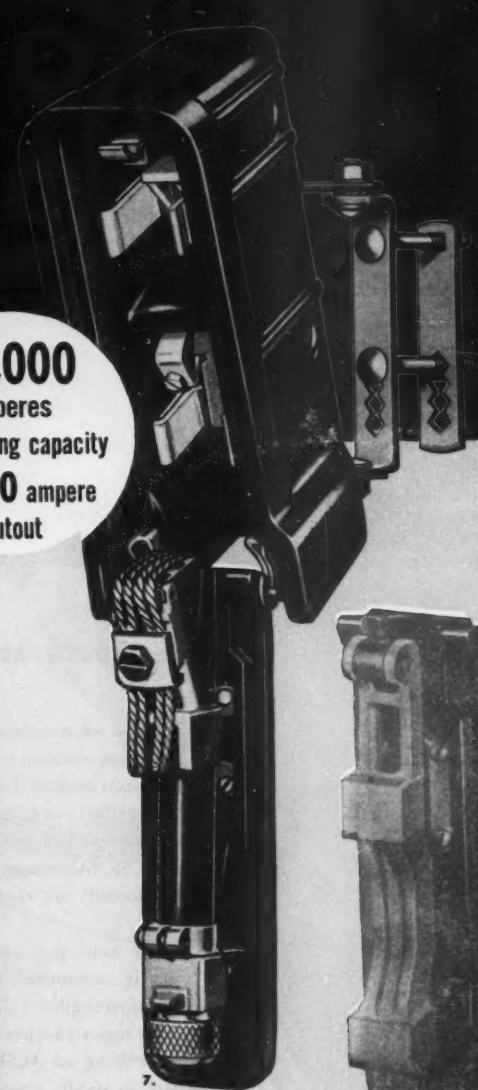
14,000 amperes interrupting capacity for **100** ampere cutout

20,000 amperes interrupting capacity for **200** ampere cutout

4. standard duty door—3000 amperes interrupting capacity

5. heavy duty door—14,000-10,000 amperes interrupting capacity

6. switch blade door—200 amperes continuous current rating



7. heavy duty door—20,000-15,000 amperes interrupting capacity

8. switch blade door—400 amperes continuous current rating

LM

LINE MATERIAL

fuse cutouts

Complete Coordinated Equipment for Distribution Today

400 ampere disconnect switch in indicating position

Through the use of this new, higher-rated switch blade, the 200 ampere cutout can now be converted simply and quickly to a 400 ampere disconnecting switch for use on higher nominal current systems. Door can be closed with hinged blade in disconnect position below the box, giving positive indication that the line is open—a unique L-M feature.

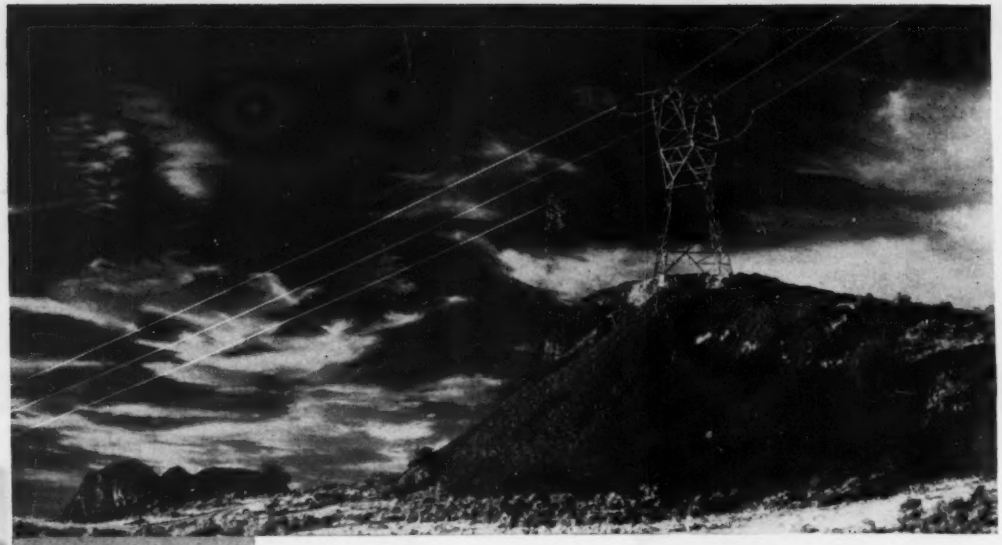
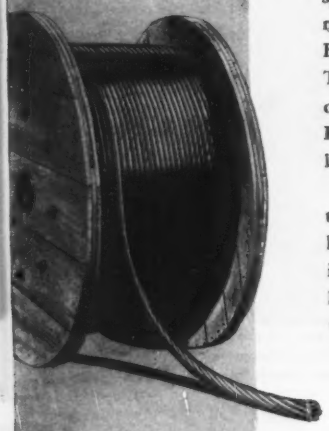


Photo courtesy Bonneville Power Administration

Long spans, heavy icing . . . make ACSR a must!



Extreme ice conditions and long spans are common in the rugged mountain country crossed by The Bonneville-Grand Coulee System. The *strength* and the *dependability* of ACSR (Aluminum Cable Steel Reinforced) are musts for such lines.

The major portion of this system is constructed with ACSR having strength of 31,200 lbs. And in the regions subject to unusually heavy icing an ACSR stranding with 38,400-lb. strength is used.

Bonneville's excellent service record stands as proof of performance of Alcoa ACSR—and of Alcoa's pioneer work in sag, tension, vibration and conductor fatigue problems.

Even though the rearmament program prevents unrestricted use of aluminum, Alcoa stands ready to help you. Look to Alcoa's 63 years of aluminum experience for assistance in planning for trouble-free power transmission projects.

GET TECHNICAL HELPS—NO OBLIGATION

Write for literature on construction of power lines, data on conductors, sag, tension, vibration and fatigue. Address: ALUMINUM COMPANY OF AMERICA, 2100-H Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA

ALCOA FIRST IN ALUMINUM FIRST IN A·C·S·R

Aluminum Cable Steel Reinforced

ARE YOU ON A MAINTENANCE MERRY-GO-ROUND?

Every year, the United States spends the fantastic sum of *over eight billion dollars* just on maintenance of its industrial plant—sad proof that too many companies are on a "maintenance merry-go-round"!

Needless to say, this huge expenditure cuts deeply into profits . . . makes it imperative for you to examine *your* maintenance costs—find ways to keep them as low as possible.

One proved way to do this is to see that all your machines get *Correct Lubrication*. This means far more than just "oils and greases." It means an analysis of your plant, recommendations of the right lubricants, guidance on when and how to use them.

Socony-Vacuum, with 85 years of experience, provides this combination of knowledge and product in one completely integrated lubrication program, tailored for your individual plant.

Why not start such a program now . . . and start cutting *your* maintenance costs?

SOCONY-VACUUM

Lubricants

SOCONY-VACUUM

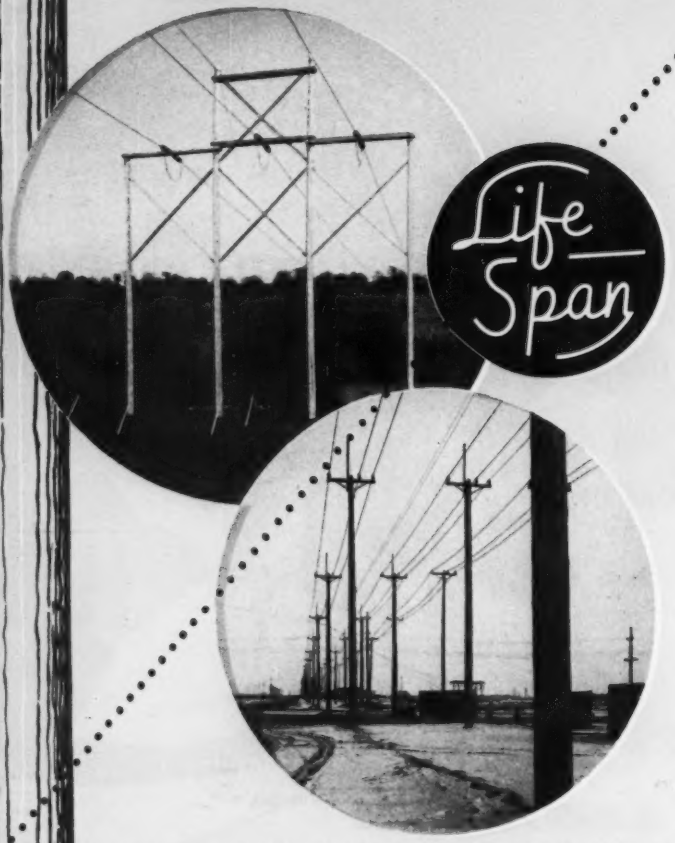
Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

LIFE SPAN *Cedar*

THE POLES THAT REFUSE TO GROW OLD



Life Span

Life Span

After 10 years of continual high-tension-line service, LIFE-SPAN treated Cedar poles are as perfect as they were at the time of installation. They still are 100% protected against deterioration and still retain 100% of the LIFE-SPAN preservative. Service life-expectancy is still ahead for all LIFE-SPAN poles.

A remarkable record which we at Consolidated Treating Co. are proud to report! We are still searching for the *first* LIFE-SPAN pole to show decay, or signs of any deterioration after 10 years of line service. Our chemists are continually making repeat tests on LIFE-SPAN installations in many parts of the country. To date, every pole tested shows true soundness, with years of line service still ahead.

Once the LIFE-SPAN pole treatment is applied, Western Red Cedar poles simply cannot rot!

CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA

Sold only by the following:

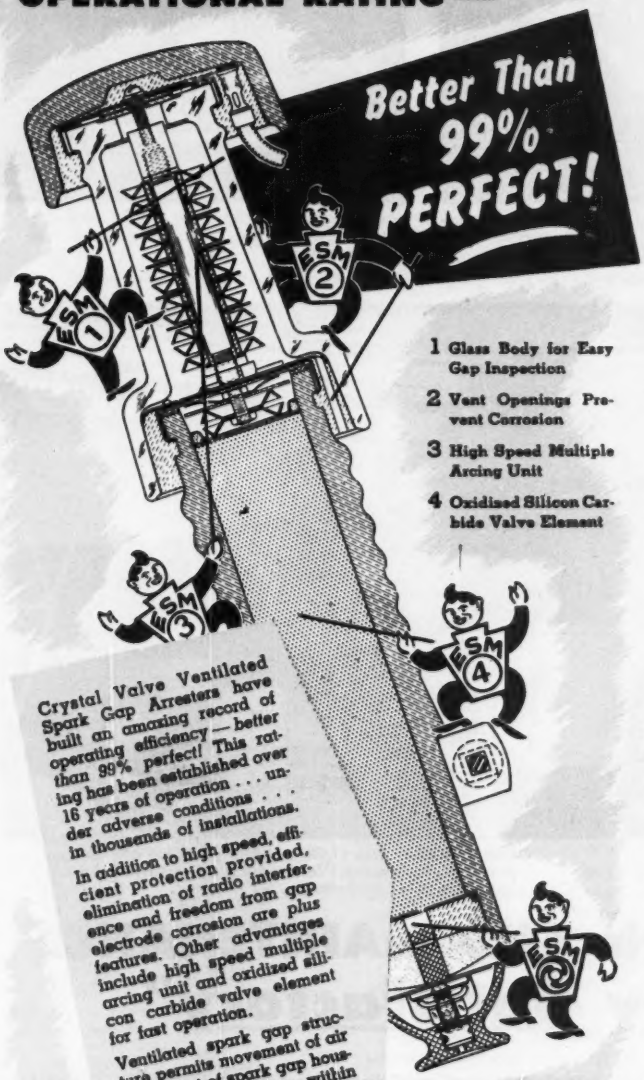
HAUGLE POLE & TIE CORP.
Chicago, Illinois

PAGE & HILL, INC.
Minneapolis, Minnesota
80 Church Street, New York, N.Y.

B. J. CARNEY & CO.
Spokane—Minneapolis

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho
Suppliers for Jeslyn Mfg. & Supply Co.

OPERATIONAL RATING —


Better Than 99% PERFECT!
1 Glass Body for Easy Gap Inspection
2 Vent Openings Prevent Corrosion
3 High Speed Multiple Arcing Unit
4 Oxidized Silicon Carbide Valve Element

Crystal Valve Ventilated Spark Gap Arresters have built an amazing record of operating efficiency — better than 99% perfect! This rating has been established over 16 years of operation . . . under adverse conditions . . . in thousands of installations.

In addition to high speed, efficient protection provided, elimination of radio interference and freedom from gap electrode corrosion are plus features. Other advantages include high speed multiple arcing unit and oxidized silicon carbide valve element for fast operation.

Ventilated spark gap structure permits movement of air in and out of spark gap housing, and circulation within housing. Air movement prevents moisture accumulation and danger of corrosion.

Write Dep't 1709 for new folder containing complete data on Crystal Valve Ventilated Spark Gap Arresters.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

Principles of Ventilated Spark Gap Arresters

by

J. R. McFarlin, Vice President
ELECTRIC SERVICE MANUFACTURING CO.

The failure rate of modern lightning arresters from all causes is relatively low; of the small percentage that do fail one of the causes frequently has to do with the accumulation of moisture in the spark gap chamber, this followed by corrosion of the spark gap electrodes. The obvious means to correct this condition is to prevent accumulation of moisture in the spark gap chamber; this may be accomplished by ventilation.

Ventilation of lightning arresters is nothing new; 60 or 70 years ago arrester units for outdoor service were generally installed in wood boxes provided with hinged doors; with such construction these were completely ventilated and rarely were the units afflicted with corrosion due to moisture. Ventilation of the modern porcelain housed lightning arrester is not so simple, but can be and has been done for many years.

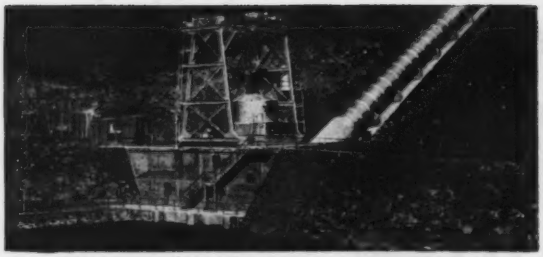
Some 35 years ago Electric Service Manufacturing Company developed and manufactured multi-gap resistance type arresters, the elements of which were enclosed in a porcelain housing which was vented at the lower or ground end; these, so far as we know, were entirely free from moisture trouble.

Some 16 years ago manufacture of Crystal Valve lightning arresters with ventilated spark gap structures was begun; these arresters have been sold throughout the world and to date not a single case of moisture trouble has come to our attention.

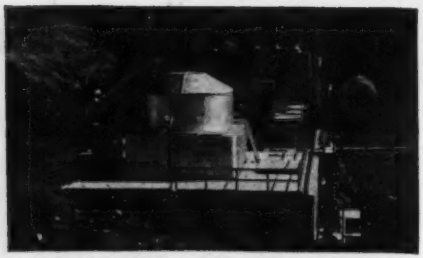
These arresters for 3.0 KV service are made in a 1-piece porcelain body; for 6.0 to 15.0 KV, inc., they are made in a composite body employing glass for housing the spark gap assembly and porcelain for housing the valve element; an illustration of the latter type appears on this page. The spark gap element of these higher voltage units is ventilated by means of openings between the glass and porcelain housings—see "2" in illustration; for the 3.0 KV units ventilation is provided by shielded openings in the base seal.

In both cases this ventilation provides free access of air in and out of the spark gap housing and circulation within the housing; any moist air that may be breathed into the housing due to decreasing ambient temperature will be breathed out when the ambient temperature increases; none of it will be retained and accumulated. The result is that the interior of the housing is maintained in a dry condition and the spark gap elements are kept dry and clean and therefore are not subject to deterioration or corrosion from moisture.

(*Advertisement*)

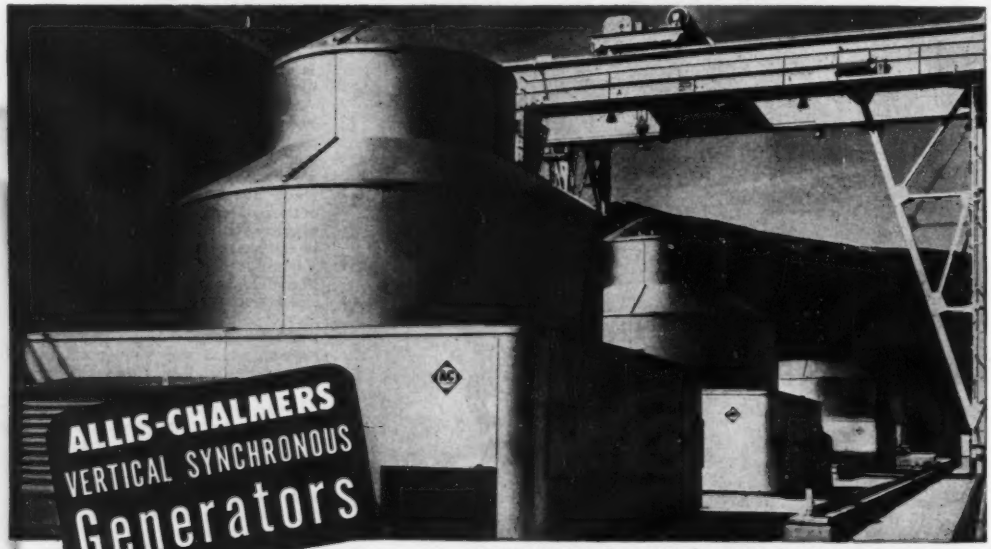


UPPER MALAD: One 8400 kva, 85.7% pf, 6900 volt, 225 rpm generator. Also, A-C 12,000 hp, 124 ft head Francis-type turbine, station-service substation, switchgear, main power transformer.



LOWER MALAD: One 15,500 kva, 87% pf, 6900 volt, 200 rpm generator. Also, A-C 22,000 hp, 157 ft head Francis-type turbine.

All generators are modified umbrella type (with upper guide bearings) furnished complete with outdoor housings.



LOWER SALMON: Four 17,500 kva, 86% pf, 13,800 volt, 120 rpm generators — two arranged for variable-pitch propellers. Also, A-C 12,000 kva power transformer.

"OPERATION AND MAINTENANCE ... Very Satisfactory"

THAT's the verdict of Mr. Lester Garlinghouse, plant superintendent of Idaho Power's new Lower Salmon, Upper Malad and Lower Malad stations. It's natural that the six Allis-Chalmers hydraulic-turbine-driven generators in these stations should be highly satisfactory: They are the result of more than 40 years' experience designing and building large generators.

Placed in operation in 1948 and 1949, these generators supply southern Idaho as part of the Northwest power pool. The Malad stations, which are remote-controlled from the Lower Salmon station, operate 24 hours a day, seven days a week. Lower Salmon is used for load factoring (peak load operation) and runs at full load an average of about 10 hours a day every day of the year.

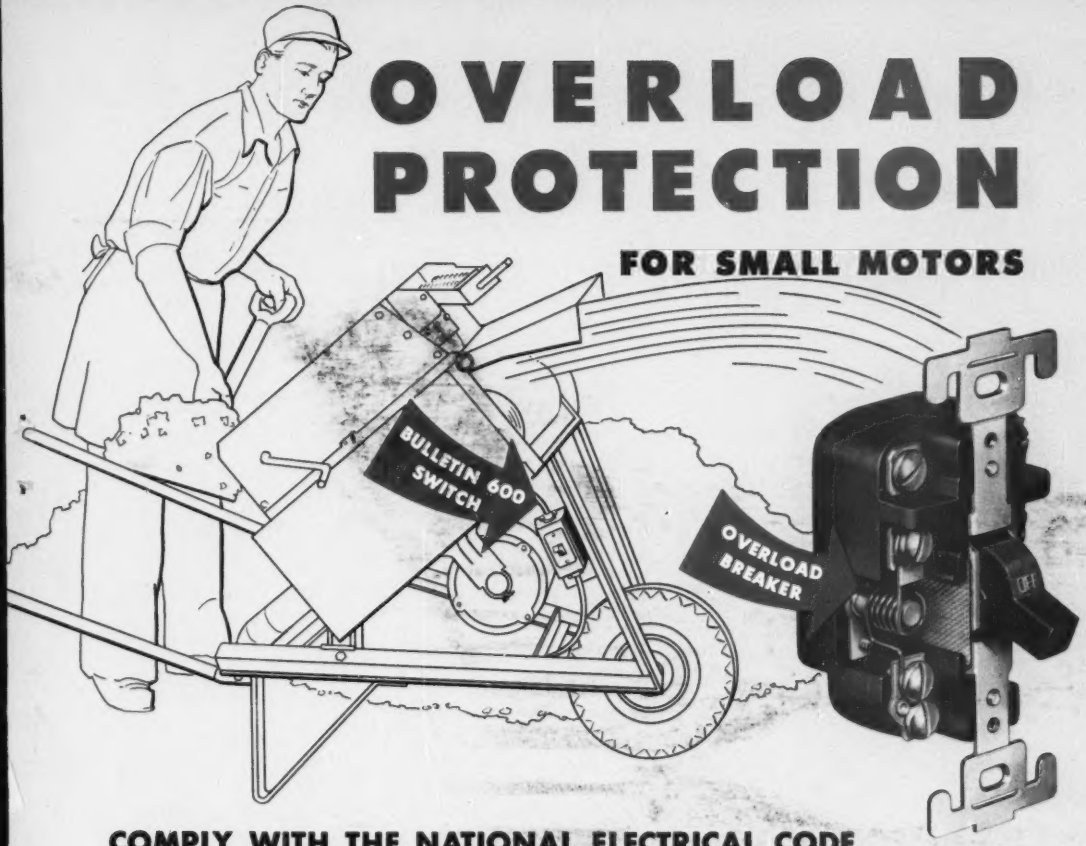
Whatever your power requirements are, you can rely on Allis-Chalmers for efficient, reliable generators custom-engineered for your installation. Types, ratings and construction features are described in new bulletin 05B7549. Contact your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wis.

A-3446

ALLIS-CHALMERS AC ALLIS-CHALMERS

OVERLOAD PROTECTION

FOR SMALL MOTORS



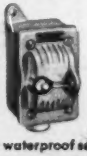
COMPLY WITH THE NATIONAL ELECTRICAL CODE

by using the Approved Bulletin 600 Starting Switch

Toggle lever switch with cover removed

Key operated for public places

For hazardous gases



For waterproof service

It looks like an ordinary snap switch . . . but something has been added . . . a self-contained thermal overload breaker. The heater element quickly detects an overload on the motor. It releases a soldered ratchet . . . the contacts snap open, automatically.

The motor is thereby disconnected before a burnout can occur . . . and it cannot restart until the toggle lever is flipped down manually to reset the overload breaker. If the overload persists, the contacts cannot be held closed by the operator.

This compact starter, rated at 1 hp, 110-220 v, is a favorite with engineers who want a small, inexpensive switch to protect fractional horsepower motors. Send for Bulletin 600.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wisconsin

5-51-MR

A-B Quality

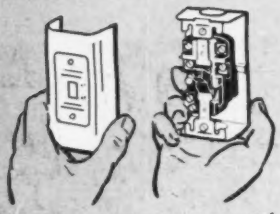
ALLEN-BRADLEY

BULLETIN 600 STARTING SWITCHES

QUALITY

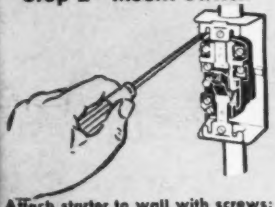
So Easy to Install...So Dependable in Service

Step 1—Remove Cover

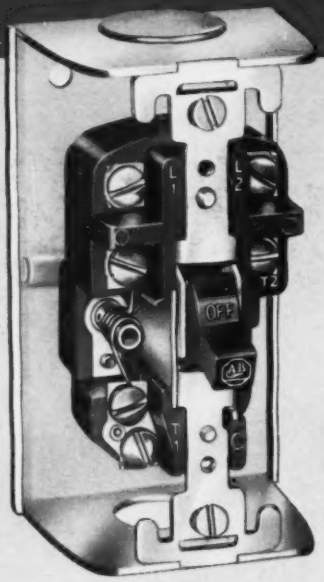


Simply remove two screws; metal cover then slips off easily, exposing the Bulletin 600 starter terminals.

Step 2—Mount Switch

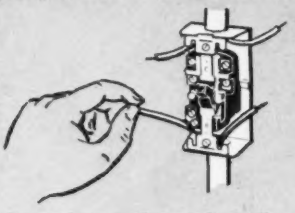


Attach starter to wall with screws; convenient conduit openings are located in the top, bottom, and back.



Bulletin 600—the ideal switch for starting and protecting small motors on unit heaters, stokers, fans, pumps, refrigerating compressors, grinders, and small machine tools.

Step 3—Wire and Connect



Line and motor wires can be easily pulled into the box without removing the starter from its enclosure.

Step 4—Replace Cover

Cover is slipped on and secured with two screws. The Bulletin 600 installation is always quick and easy.

BULLETIN 600 MANUAL STARTING SWITCH for SMALL MOTORS

Two starters in one enclosure

Starter with selector switch

Starter with pilot light

Watertight starter with pilot light

In standard wall box

AVAILABLE IN ENCLOSURES FOR EVERY APPLICATION

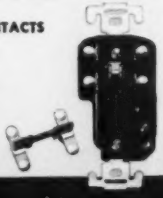
Side view of starter, showing heater element coiled around the stud.

THERMAL OVERLOAD BREAKER

Soldered ratchet of overload breaker is mounted on a heater stud. Around the stud is the coiled thermal element which heats the stud. Overload melts the solder; ratchet is released. This automatically opens switch with snap action.

DOUBLE BREAK SILVER ALLOY CONTACTS

Switch contacts are quick make, quick break. In the 2 pole construction, each side of line has two stationary contacts bridged by the double moving contacts. They need no contact maintenance, because they form no insulating oxides.



5-51-M

A-B Quality

ALLEN-BRADLEY

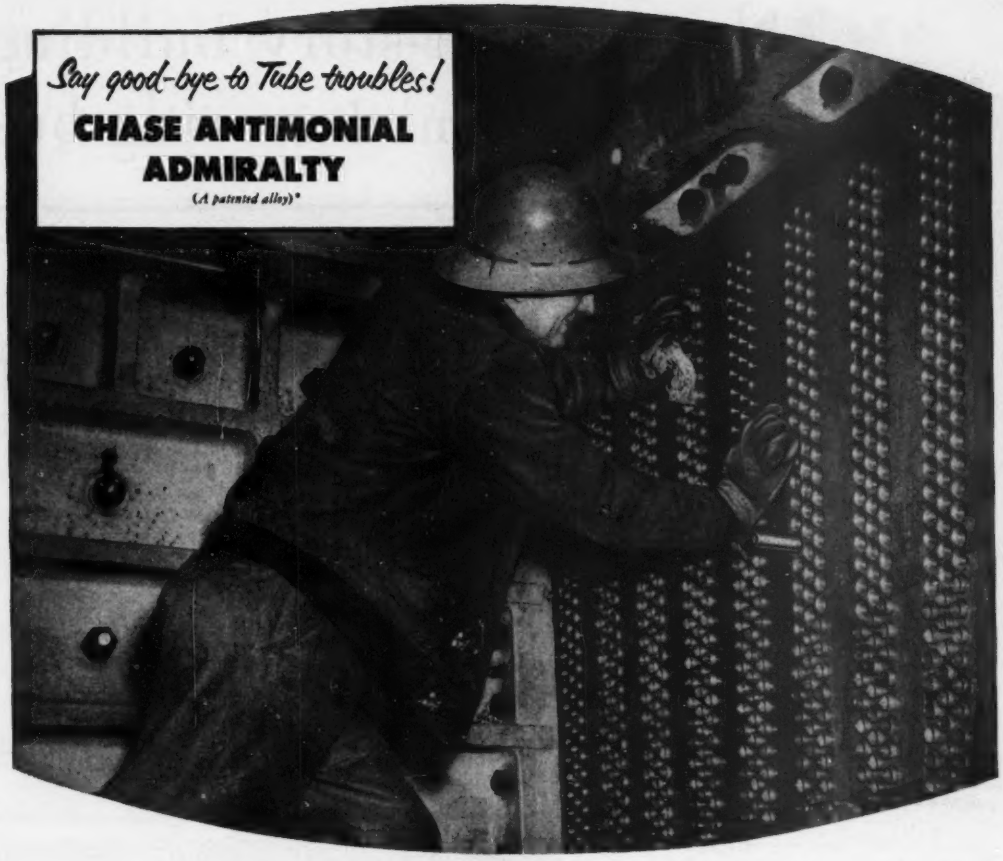
BULLETIN 600 STARTING SWITCHES

QUALITY

Say good-bye to Tube troubles!

CHASE ANTIMONIAL ADMIRALTY

*(A patented alloy)**



LONG-LASTING because there's enough antimony to resist dezincification.

LONG-LASTING because antimony doesn't affect the grain structure of the metal—won't weaken the tube.

LONG-LASTING because years of tests and actual use of Chase Antimonial Admiralty have proved that the right amount of antimony increases the life of the tube.

Send coupon for Free Book on Condenser and Heat Exchanger Tubes.

CHASE WAREHOUSE STOCKS: *NEW YORK, BALTIMORE, NEW ORLEANS, LOS ANGELES,* also carried by—*Vinson Supply Co., Tulsa; Standard Brass & Mfg. Co., Houston.*

*U.S. Pat. No. 2,061,921

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CHASE 75th ANNIVERSARY 1876 - 1951

FREE CHASE BOOK discusses corrosion problems and selection of proper alloy for condenser and heat exchanger tubes.

Chase Brass & Copper Co., Dept. EW851
Waterbury 20, Conn.

Please send me Free Book on Condenser and Heat Exchanger Tubes.

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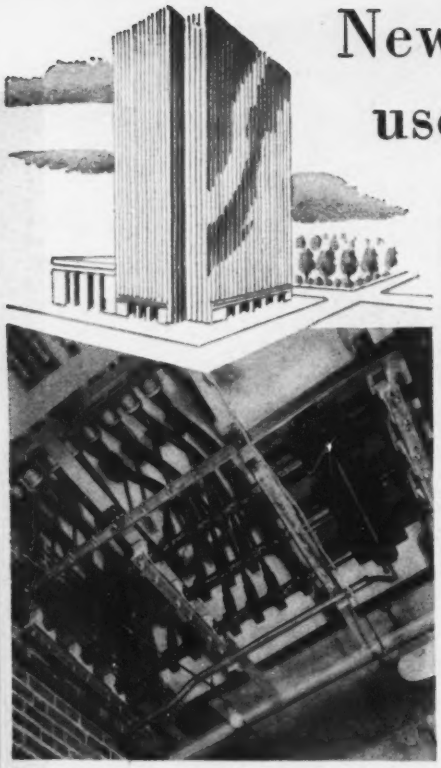
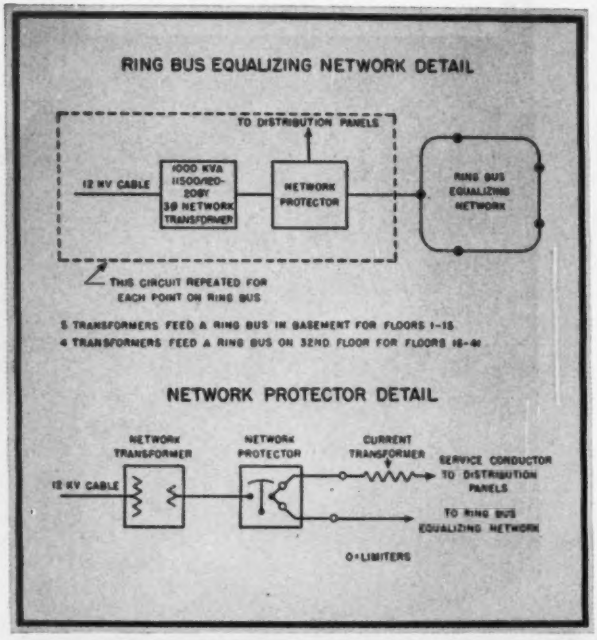
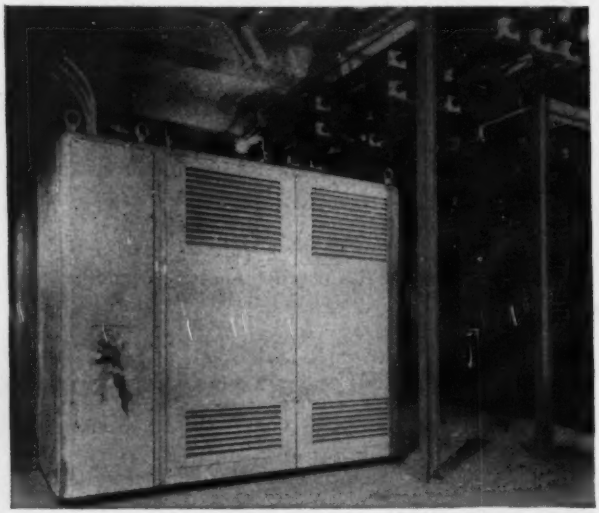
New 41-story building uses modern ring bus



32nd floor transformer room: Conduit at upper left goes to distribution panels. Notice current transformers at upper right.


RING BUS EQUALIZING NETWORK DETAIL
TO DISTRIBUTION PANELS
12 KV CABLE
4000 KVA 11500/120-208Y 3Ø NETWORK TRANSFORMER
NETWORK PROTECTOR
RING BUS EQUALIZING NETWORK
THIS CIRCUIT REPEATED FOR EACH POINT ON RING BUS
5 TRANSFORMERS FEED A RING BUS IN BASEMENT FOR FLOORS 1-15
4 TRANSFORMERS FEED A RING BUS ON 32ND FLOOR FOR FLOORS 16-41
NETWORK PROTECTOR DETAIL
NETWORK TRANSFORMER
NETWORK PROTECTOR
CURRENT TRANSFORMER
SERVICE CONDUCTOR TO DISTRIBUTION PANELS
12 KV CABLE
TO RING BUS EQUALIZING NETWORK
O=LIMITERS

This is the ring bus network in basement. The 5 transformers that feed it are equalized by means of the ring bus.



Here are two of the 100 KVA transformers on the 32nd floor. Network protectors are mounted on front of the transformers. Ring bus equalizing network is overhead, fed by network protectors. These protectors also feed the distribution panels.

protected against power failure equalizing network made from

AMERBESTOS

525 WILLIAM PENN PLACE, PITTSBURGH, PA., is modern from the word go. It has all the things that make a building easy to work in and easy to maintain.

This handsome building is *completely* air-conditioned. It has stainless steel windows and spandrels, "Q" floors for flexible floor layout, movable steel wall partitions, acoustical ceilings, glareless fluorescent lighting.

But to electrical engineers, the thing that stands out most is the advanced electrical distribution system. It features a ring bus equalizing network that guarantees power to the entire building even if one of the main 1,000 KVA transformers should fail. The diagram shows how it works:

The output of each 11,500/120-208 Y, 3ϕ network transformer is fed through the network protector to the ring bus and the distribution panels. If a fault should develop in one of the transformers the network protector would kick open. But the affected distribution panels would still be fed by the other transformers through the ring bus network, which is well protected by limiters. In other words, the voltage in all five sections would be automatically equalized in case one section should fail.

As a further precaution, the power company furnishes current from the power station via 5 separate feeders through a ring bus. Failure at the power station would probably affect only one feeder, but all transformers would still be served. Over-all building power would continue, uninterrupted.

American Steel & Wire Company furnished the bulk of the wiring that will assure unfailing power to this great building—from the 3,000,000 C/M Amerbestos main ring feeder and thousands of feet of 500,000 C/M Amerbestos secondaries—to the millions of feet of Amarine-Amperox heat and moisture resisting circuit wiring.

But as every designer and contractor knows, supplying the proper wire and cable is only half the job. Equally important is the application experience of the supplier. At 525 William Penn Place we worked closely with everyone concerned with the electrical installation. As a result of this cooperation, the work was finished with complete coordination.

When American Steel & Wire Company supplies your electrical wire and cable, you can be sure of this same cooperation from our highly-skilled engineers. We'll be glad to discuss the entire range of special purpose conductors available. We'll help you select the best and most economical grade for your particular job, and we'll give you valuable assistance on installation problems.

For more information, get in touch with our nearest district engineer or write American Steel & Wire Company, Rockefeller Building, Cleveland 13, Ohio.

AMERICAN STEEL & WIRE COMPANY
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA STEEL COMPANY, SAN FRANCISCO
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American Electrical Wire and Cable

UNITED STATES STEEL

A ONE MAN "FIRE ENGINE"

—the Kidde Dry Chemical Wheeled Extinguisher

You *can* control a roaring fire in flammable liquids, transformers, circuit breakers, bus bays or vaults. The Kidde 150 Pound Dry Chemical Wheeled Extinguisher packs a fire-fighting wallop that brings large fires under control quickly and easily.

The new "instant flow" hand control enables you to beat back fire with a long range "straight" stream... or to blanket the fire completely by the wider coverage which you get from the improved "fan" pattern.

One man can wheel this extinguisher through a standard doorway... apply 150 pounds of fire-smothering dry chemical in less than one minute.

Write for complete information on this new Kidde Dry Chemical Wheeled Extinguisher... or the full line of Kidde fire extinguishers and built-in systems.

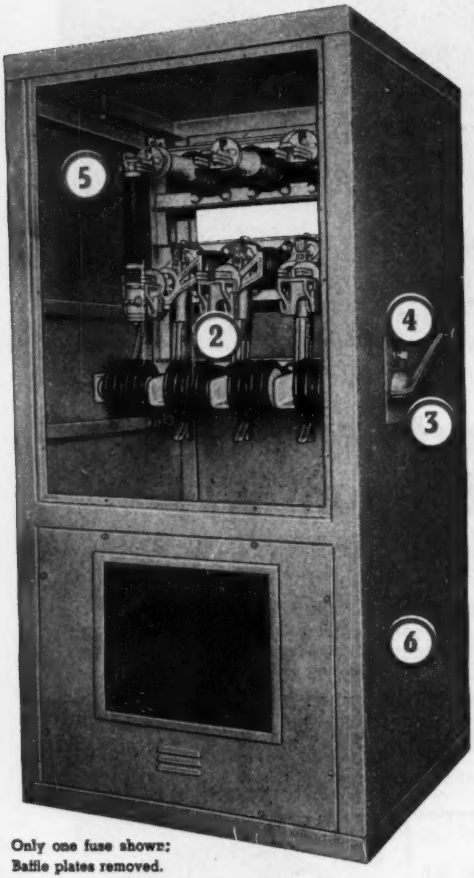
Kidde

Walter Kidde & Company, Inc., 830 Main Street, Belleville 9, New Jersey

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Install R&IE INTERRUPTER SWITCHES

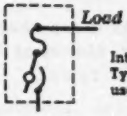
for *Safe* ECONOMICAL PROTECTION *at* LOAD CENTERS



Only one fuse shown: Baffle plates removed.

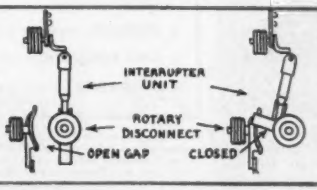
Check the facts

1. Compact, easy to install, mounts anywhere — wall, transformer throat, etc.
2. Reliable load interrupter and open gap switch assembly, single or double throw.
3. Operating handle equipped with sequencing device to prevent opening of switch before it is fully closed. This guarantees proper interrupting operation.
4. Provision for Kirk Key Interlock or Solenoid type system.
5. Any fuse combination — above interrupter as shown, or below, if required.
6. Housing can be furnished. Key or mechanical door interlocks optional.



Wiring diagram showing arrangement of equipment. Interrupter Switch fused on load side. Typical of many load center switches used with dry type transformer.

The R & IE plunger type interrupter chamber quenches the arc by an accelerated movement of a horn fibre plunger follower into a horn fibre lined tube. The arc is drawn out between two electrodes into the narrow space between, causing the interruption in the current. An open gap is made between the electrodes and later visibly established by the rotary disconnect switch blade.



RAILWAY and INDUSTRIAL ENGINEERING CO. Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

ELECTRICIAN WRAPS CABLE SPLICE with "SCOTCH" No. 33 Electrical Tape. Similar splices have been under water 22 months.

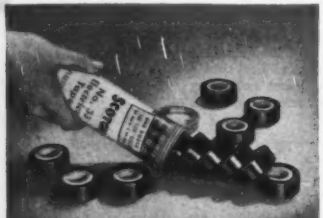
Plastic tape protects cables under water for 22 months!

Electric power for the Houston, Texas, Municipal Airport is supplied by a 3-conductor 5,000 volt Parkway cable that has splices protected with "SCOTCH" No. 33 Electrical Tape. A recent inspection of a flooded field vault revealed splices were still dry after 22 months under water. No lead sleeve, no lead splice — just 5 half-lapped layers of this tough plastic tape did the job perfectly!

And "SCOTCH" No. 33 Electrical Tape is more than waterproof. It's abrasion-resistant—makes smooth, neat splices, and is unaffected by acids, alkalies, oils and alcohols. Stretchy and super-thin, too, with a dielectric strength of 10,000 volts.

The new "Job Size" roll is just what you've been looking for—compact, economical, yet large enough to handle many jobs since this tape replaces two *conventional* insulating tapes. Order it today from your jobber! It's the ideal many-purpose tape.

REMEMBER: for high-heat insulation —"SCOTCH" No. 27 Electrical Tape. Glass cloth backing, thermosetting adhesive.



NEW "JOB SIZE" ROLLS are packed 12 in a screw-top container to keep out dust and dirt, prevent bruising of tape in tool boxes. Rolls are ¾ inch x 20 feet. Standard 66-ft. rolls are individually packed in tin cans.

Quick Facts about "SCOTCH" Electrical No. 33 Tape

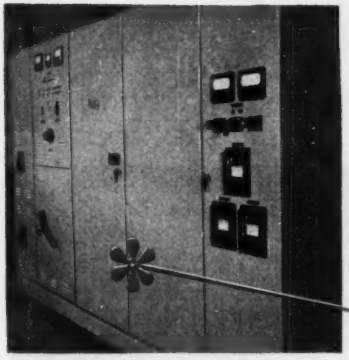
- ★ **TOUGH**—resists acids, alkalies, alcohols, sunlight, abrasion
- ★ **STRETCHY**—conforms to any surface
- ★ **HIGH DIELECTRIC**—10,000 volts
- ★ **LONG-LIVED**—won't dry out

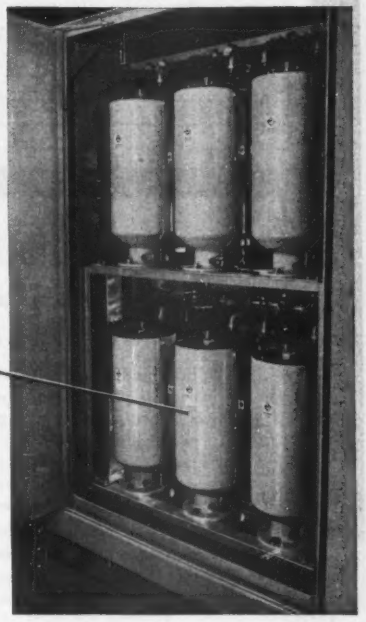
SCOTCH BRAND Electrical Tape No. 33

The term "Scotch" and the plaid design are registered trade-marks for the more than 100 pressure-sensitive adhesive tapes made in U.S.A. by **MINNESOTA MINING & MFG. CO.**, St. Paul 6, Minn. — also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: Minnesota Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N.Y. In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada

Don't build around obsolete DC supply

—RETIRE IT NOW!





Modern Allis-Chalmers factory packaged, sealed tube, 500 kw mercury arc rectifier as installed in midwestern industrial plant. Left: "dead-front" compartments for dc feeders, dc metering and cathode breaker, rectifier tubes, and ac control and metering. Right: interior view of mercury arc rectifier tube compartment.

NOW IS THE TIME to retire obsolete converting and generating equipment. As operations expand, this inadequate equipment will become a growing handicap.

Now too — while there is a favorable base for amortization — is the time to consider mercury arc rectifiers for your expansion plans. Let Allis-Chalmers show you how the *modern* mercury arc rectifier can improve your direct current service.

LOW MANPOWER REQUIREMENT. With push-button starting and no synchronizing required, attendants are not needed during normal operation. Down-time for maintenance is reduced with no moving parts to lubricate or wear.

LOW COST OPERATION. Conversion efficiency is higher at all loads with large power savings during light load periods.

CONVENIENT INSTALLATION. Factory packaged, light in weight, and requiring no special foundation, Allis-Chalmers mercury arc rectifiers may be placed right at the load center.

IMPROVED PLANT OPERATION. With dc load center installation, distribution distances are cut, dc feeder losses are reduced, and full voltage is available at production equipment.

Whatever your specific direct current needs, Allis-Chalmers builds suitable and truly modern mercury arc rectifiers to meet them.

Sealed tube rectifiers (as shown above) are supplied in ratings from 200 to 1000 kw for lighter duty service. These are commonly used in large buildings, industrial plants and electric haulage systems. Pump evacuated rectifiers are built from 750 kw to the largest ratings required for heavy duty applications.

An Allis-Chalmers representative will be glad to explain in detail how these modern mercury arc rectifiers will improve the operation of *your* direct current system. Call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3467

ALLIS-CHALMERS A-C

MERCURY ARC RECTIFIERS

HERE'S PROOF...

RESULTS OF TRANSFORMER OIL PURIFICATION TESTS

WEST FARGO SUBSTATION . . . FARGO DIVISION . . . AUGUST 29 AND 30, 1950

Duration Hrs.	Trans. No. 2682129—(569 Gal.)				Trans. No. 2682130—(569 Gal.)				Trans. No. 2682127—(569 Gal.)			
	Acidity		I. F. T.		Acidity		I. F. T.		Acidity		I. F. T.	
	From	To	From	To	From	To	From	To	From	To	From	To
0	.39		15.9		.42		16.5		.39		16.8	
.5	.14	.02	21.6	41.4	.14	.02	20.8	40.2				
1	.13	.03	21.3	38.8					.15	.08	22.1	36.1
1.5	.10	.03	23.5	38.7	.09	.05	24.7	36.9				
2	.06	.04	31.3	37.1					.11	.12	32.9	34.4
2.5	.06	.05	33.9	36.7	.03	.04	36.0	37.3				
3	.05	.05	33.6	37.6	.04	.04	34.9	38.2	.10	.10	34.0	34.6
3.5												
4									.06	.05	35.7	37.6

. . . Houdaille *Purivac*

Cleans Insulating Oil to New Oil Specifications!

Utilities and power plants have proved that regular PURIVAC oil purification is sound preventive maintenance. PURIVAC purification prolongs the useful life of oil . . . keeps transformers and circuit breakers *clean* . . . prevents accumulation of contamination . . . reduces power failures and equipment damage caused by oil deterioration. Records* prove PURIVAC restores and maintains all desirable qualities of new insulating oil.

. . . and with PURIVAC You Get These Added Benefits:

1. PURIVAC performs complete purification, dehydration and degasification, in *one operation.* No blotter press required. Operating cost is very small.
2. Performs equally well in the field or at a central station.
3. No service interruptions. PURIVAC purifies oil while transformers, circuit breakers, etc., are in operation.

HONAN-CRANE CORP. • 819 WABASH AVE. • LEBANON, INDIANA

A SUBSIDIARY OF

HOUDAILLE-HERSHEY CORPORATION

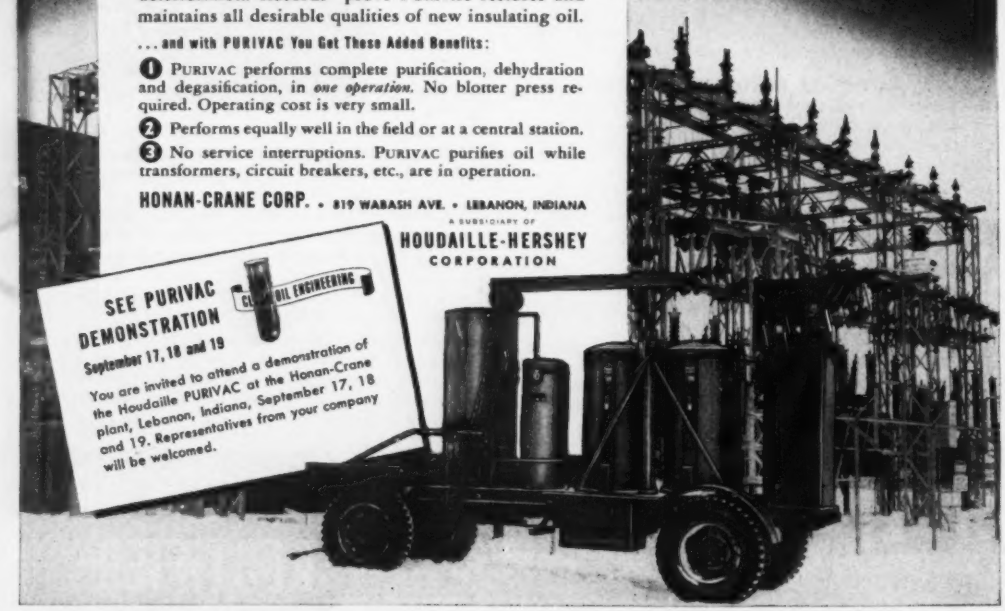
* Data above shows results of tests made during PURIVAC purification runs on oil in transformers owned by Northern States Power Company at sub-station in West Fargo, N. D.

PURIVAC unit is owned and operated by Minnkota Electric Service Co., Fargo.

SEE PURIVAC DEMONSTRATION

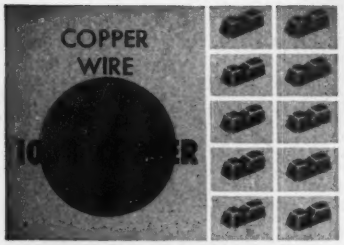
September 17, 18 and 19

You are invited to attend a demonstration of the Houdaille PURIVAC at the Honan-Crane plant, Lebanon, Indiana, September 17, 18 and 19. Representatives from your company will be welcomed.

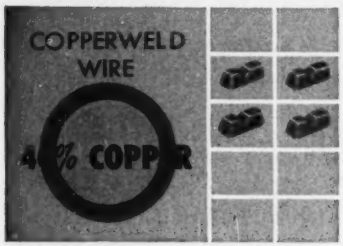


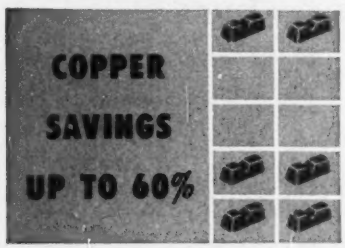
COPPER IS VITAL TO NATIONAL SECURITY — CONSERVE IT

Question: HOW CAN I [illustration] COPPER?



Answer: **USE Copperweld** TRADE MARK **-IT CONTAINS LESS COPPER**





Study these Copperweld Advantages:

CONDUCTIVITY . . . Copperweld* Power Conductors assure adequate electrical conductivity and use the minimum amount of copper necessary to do this job.

STRENGTH . . . The protected steel core of each Copperweld Wire provides the permanent high strength that permits the stringing of longer spans. This means less poles, hardware and accessories are needed thereby reducing construction costs. Thus, by taking advantage of Copperweld's ruggedness, the use of oversized copper conductors to obtain necessary mechanical strength can be eliminated.

PERMANENCE . . . Copperweld has all the rust-resistance of solid copper yet uses less copper.

TIME AND COST REDUCTIONS . . . Each year you'll save on repairs and maintenance because of Copperweld's unique combination of advantages. Man-hours and copper—both vital to you and to the National Security Program—are conserved and used with greater efficiency when you install Copperweld Power Conductors.

*Trade Mark

Write today for your copy of the Copperweld Engineering Data Book

COPPERWELD SAVES COPPER

COPPERWELD STEEL COMPANY ***Glassport, Pa.***

SALES OFFICES IN PRINCIPAL CITIES

Copperweld TRADE MARK DEPENDABLE **POWER CONDUCTORS**

MADE BY THE EXCLUSIVE COPPERWELD MOLTEN-WELDING PROCESS

Are you walking a tightrope between wood preservatives?

IF THERE's any doubt in your mind about which method of wood preservation to use on your job, think this over:

No other preservative can match the records of long-lasting protection of creosote oil.

And here's another point to remember:

The amount of wood treated each year with creosote oil is many times the amount treated with all other preservatives combined.

For unvarying uniformity of product, adequate penetration and high toxicity, use or specify U·S·S Cresote Oil. Product quality and prompt service are assured you by the extensive facilities of United States Steel.

UNITED STATES STEEL COMPANY
525 WILLIAM PENN PLACE · PITTSBURGH 30, PA.

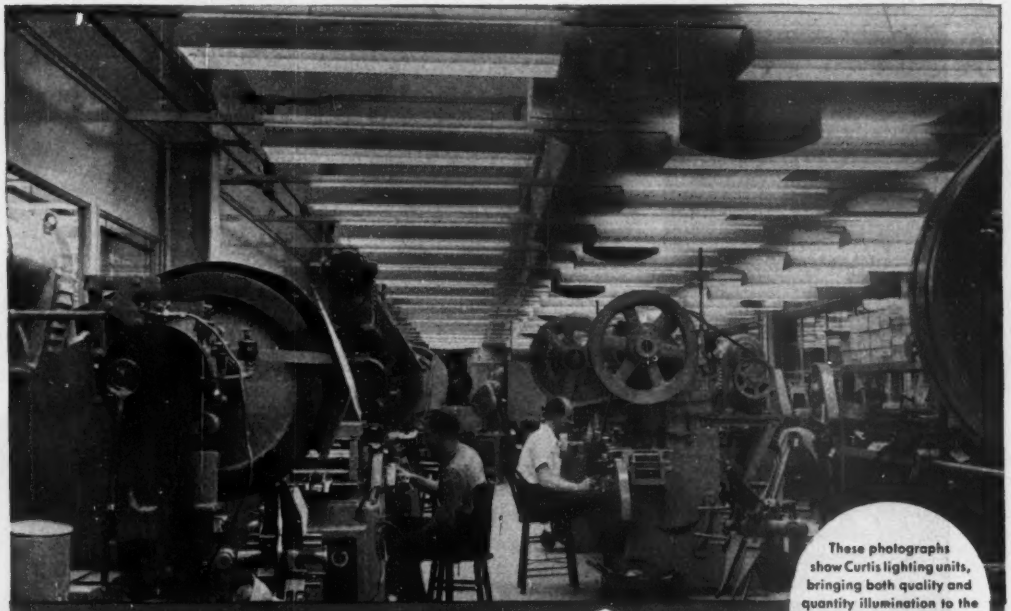
71 Broadway, New York 6, N. Y.
208 South La Salle St., Chicago 90, Ill. 1509 Terminal Tower, Cleveland 13, Ohio
Brown-Marx Building, Birmingham 2, Ala. 25 Beale St., San Francisco 5, Calif.
United States Steel Export Company, New York

USS

CREOSOTE OIL

UNITED STATES STEEL

CURTIS industrial lighting is engineered for . . . . . .



These photographs show Curtis lighting units, bringing both quality and quantity illumination to the Metals Controls Corporation plant in Attleboro, Mass.

PEAK PRODUCTION

WRITE for the complete, illustrated story of how Curtis Engineered Industrial Lighting brought an entirely new concept to an industrial lighting problem

CURTIS LIGHTING, INC.
DEPT. H18-14, 6135 W. 65TH ST., CHICAGO 38, ILLINOIS

Name_____

Address_____

City_____ State_____

NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

TIDD
JENNISON
CECIL LYNCH
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W. SPRINGFIELD
WOOD RIVER
LAKE CATHERINE
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DAN RIVER
JIM HILL
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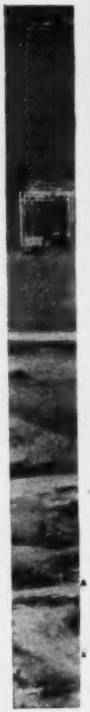
YATES
DUNKIRK
TITUS
LEE
CONTRA COSTA
HAWTHORN

NINEMILE POINT

EDGE MOOR
PALATKA
DANSKAMMER
JOHNSONVILLE
MERAMEC
CLERMONT
BLACK DOG
ALBANY
LAWRENCE
HENNEPIN
EAST LAKE
OAK CREEK
ETIWANDA
AURORA

NEW



The first unit of Louisiana Power & Light Company's new Ninemile Point Steam Electric Generating Station was recently placed in service. This unit, a preferred standard of 60/66,000 kilowatt rating, is expected to have a net capability of 70,000 KW.

Located on the right bank of the Mississippi River, Ninemile Point takes its name from the location — nine miles upstream from the Custom House at New Orleans. The plant is designed to accommodate a total of four generating units, the second unit being scheduled for operation in November, 1952.

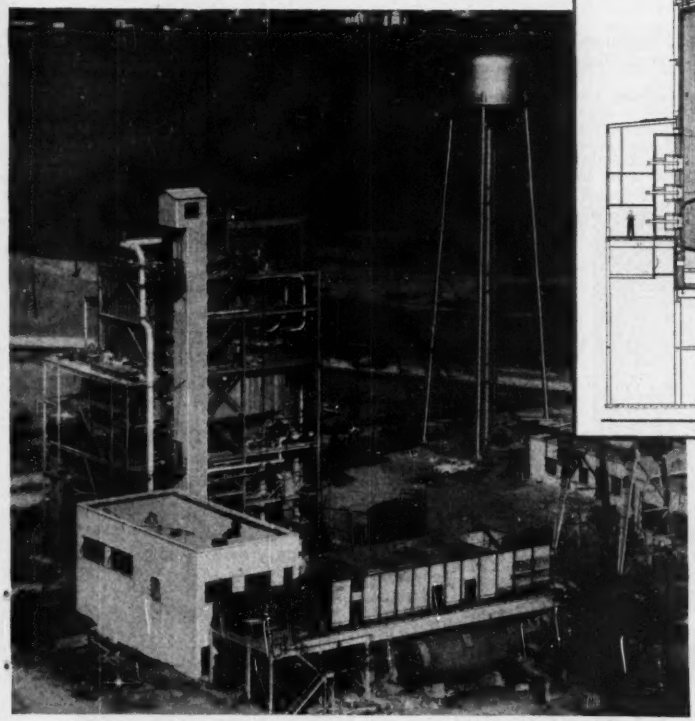
This new plant together with Louisiana Power & Light Company's Sterlington Station in North Louisiana, will supply the growing demands of 564 communities served by the Company. Ebasco Services, Inc., are the Designing Engineers and supervised construction.

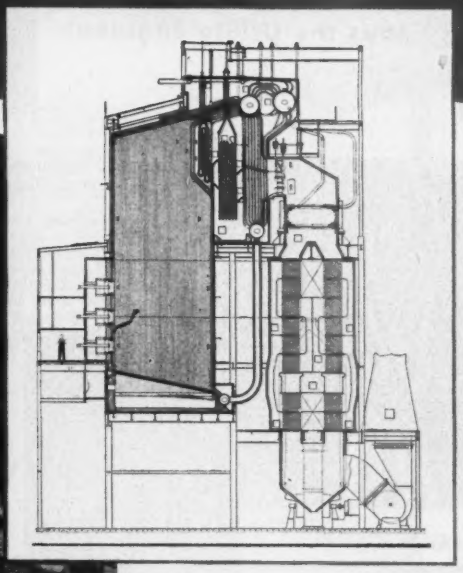
Steam for the above mentioned generating unit is supplied by a C-E Steam Generator, a cross sectional elevation and brief description of which appear on the opposite page. B-505

C-E

COMBUSTION
200 MADISON AVENUE, NEW YORK 16, N. Y.

Ninemile Point Station goes into service





The cross sectional view above shows the C-E Steam Generating Unit that was recently placed in service at the Ninemile Point Station. It is a 3-drum boiler with 2-stage superheater and has finned tube economizer surface following the boiler convection bank. A twin-bank, tubular air heater follows the economizer. The furnace is fully water cooled employing closely spaced plain tubes on side and rear walls and finned tubes on the front wall and roof. The unit is arranged for natural gas firing and is designed to produce 650,000 lb of steam per hour at 1350 psi and 955 F.

ENGINEERING—SUPERHEATER, INC.

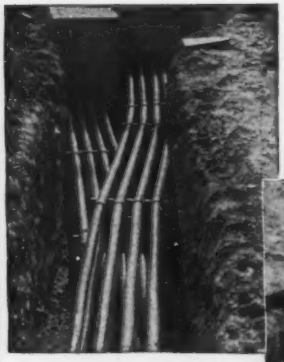
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

"Well protected cables keep power flowing

That's why I specify

ORANGEBURG"

—says the Utility Engineer



ORANGEBURG STANDARD

. . . installed with concrete encasement. The *preferred* conduit for banks of three or more ducts.

ORANGEBURG NOCRETE

. . . installed *without* concrete encasement. Its extra heavy wall makes NOCRETE practical for many single or double duct runs.

Here are some of the ways by which Orangeburg® Fibre Conduit protects cables and wins the confidence of Utility Engineers.

• Will not corrode. Lasts indefinitely. • Impermeable wall and tight joints prevent corrosive ground waters from entering. • Lays faster and at lower cost than any other type of conduit. • Low coefficient of friction keeps pulling tensions on cable to minimum. • Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads. • Resists acids, alkalis, grease, oil. • Light, easy to handle and tool on the job. • Tough, resilient—will not crack or break when properly handled.

Nearly 19,000,000 More Potential Users

Since 1940, the national population has shot well beyond 150,000,000. There are now nearly 19,000,000 more people than there were ten years ago calling on industry and business to produce the goods and provide the services they demand. This, of course, greatly expands the need of electrical services. Ever-increasing amounts of the *vital fluid* must be kept flowing to industry, business, all service institutions and homes.

But only fully protected cables can transmit power unfailingly. Realizing this, more and more public utilities and municipalities are turning to Orangeburg Conduit. Why? Because the Utility Engineer knows . . . as he has known for 58 years . . . that Orangeburg provides a time-defying raceway for the permanent protection of electrical services underground.

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG FIBRE CONDUIT

STANDARD Installed with Concrete

NOCRETE Installed without Concrete

Graybar ELECTRIC COMPANY

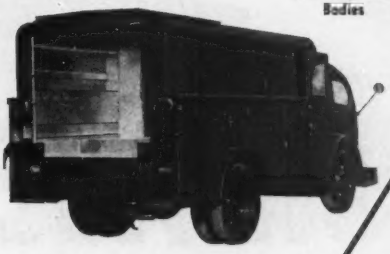
DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

GENERAL ELECTRIC SUPPLY CORPORATION

Branches and Stocks in Principal Cities

The dependable name in Utility Bodies

Cable Splicer Bodies

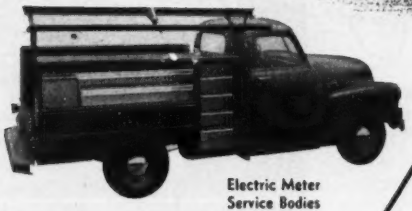


Air Compressor Bodies

Utility Compartments

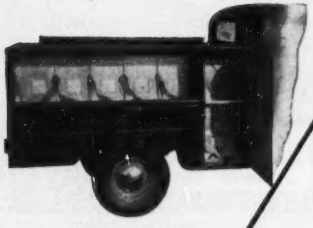
Heavy Duty Hydraulic Towers

HOLAN



Electric Meter Service Bodies

Line Construction Bodies



Gas Meter Service Bodies

Every Holan Utility Body is designed to give economical operation . . . constructed to give extra years of trouble-free service.

For utility bodies, for utility body parts and accessories, for utility body repair service . . . the dependable name is Holan.

J. H. HOLAN CORPORATION

BODIES and ACCESSORIES for UTILITIES

4100 West 150th Street — Cleveland 11, Ohio

DISTRICT SALES REPRESENTATIVES

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Baker Equipment Engineering Co.
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P. O. Box 1516
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Portland 14, Oregon

YOU* ASKED FOR IT!

National Electric's

SURFACEDUCT

No fishing . . .
Unobstructed
wiring channels

. . . for flexible lighting
arrangements

. . . electrical
modernization

*

Easily rerouted . . .
Minimum of fittings . . .

Low cost . . .
Low maintenance . . .

Safe . . . Light . . . Strong

A small, all-purpose
electrical raceway . . .

Easily installed . . .
Completely accessible . . .

Field research proved the need for Surfaceduct. *Electrical contractors, electrical wholesalers, industrial engineers, plant maintenance men, architects—all told us what they wanted in a general purpose electrical raceway system.

Surfaceduct was designed in strict accordance with the advice and suggestions of these men in the electrical field who were to install or specify it. The engineering "know-how" National Electric had attained as pioneer manufacturer of surface raceways took Surfaceduct from the blueprint stage to production and on to an enthusiastic reception by the electrical trade.

Today, only six short years after its introduction, Surfaceduct is efficiently serving electrical applications requiring light or power up to 60 ampere service. Listed by Underwriters' Laboratories, Inc. Sold through electrical wholesalers everywhere.

Write for additional information.

EVERYTHING ON WIRING POINTS TO

National Electric
PRODUCTS CORPORATION
1305 CHAMBER OF COMMERCE BLDG. • PITTSBURGH 19, PA.

WHY do modern plants use drawout switchgear?

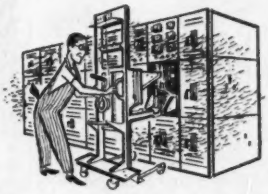
The key to high production in modern plants is continuous electrical service. Drawout construction is the switchgear feature that assures service continuity by means of interchangeable circuit breakers. In general, drawout construction advantages are:

1 reduced labor costs

When loads change and it becomes necessary to change breaker ratings because of new circuit requirements, it can be done easily on a spare breaker which is then substituted in the switchboard.

2 less down time

When changing breakers for any reason, total outage time need not exceed several minutes. One spare breaker can provide adequate, economical insurance for 20 or more feeder circuits.



3 improved plant safety

Breakers can be withdrawn from the enclosure. The breakers and the associated circuits may readily be inspected, adjusted, and maintained—without danger to the operator.

Drawout construction is just one of the reasons for the superiority of I-T-E Low Voltage Switchgear. Like so many other features, drawout construction was popularized by I-T-E, where switchgear is a business, not a sideline.

For further information, write I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania. Subsidiaries: Railway and Industrial Engineering Company, Greensburg, Penna., and Eastern Power Devices, Ltd., Toronto.

The I-T-E Company

FREE BOOKLET—Gives complete engineering data on the new Kaiser Aluminum Conductor. Includes both weatherproof and self-supporting conductor. Send for it today!

MORE ADVANTAGES—Neoprene covering on Kaiser Aluminum Weatherproof Conductor is abrasion resistant, fungi resistant . . . and there's no festooning as with conventional textile coverings.

HIGHEST QUALITY—Our production personnel have had long experience in the conductor field, employ the finest production facilities. Conductor is tested by the most modern instruments.

TECHNICAL ASSISTANCE—Our large staff of experienced service engineers will gladly provide technical assistance and help with construction problems. Call any Kaiser Aluminum office. See your Classified Telephone Directory.

This line means lower costs, longer life!

WHEN you install Kaiser Aluminum Weatherproof Conductor for distribution lines or service drops you cut costs by 30 to 40 per cent.

Here's why: 1) First cost is lower than with copper. 2) Reduced weight—approximately half that of copper—permits longer spans, speeds installation. 3) Diameters are smaller than the usual triple braid weatherproof, reducing ice and wind loads, relieving tension on house and pole.

Once installed, Kaiser Aluminum Weatherproof Conductor can be virtually forgotten. Good splices and taps are assured because it's clean stripping. The neoprene covering is smooth, homogeneous, seamless, thus resists moisture.

Apply these advantages to *your* installations. Call us today for all the facts.

Sales offices in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.

Kaiser Aluminum

Setting the pace . . . through quality and service

Specify
ACCURATE TAPES
—for every wiring need!

ACCURATE FRICTION TAPE

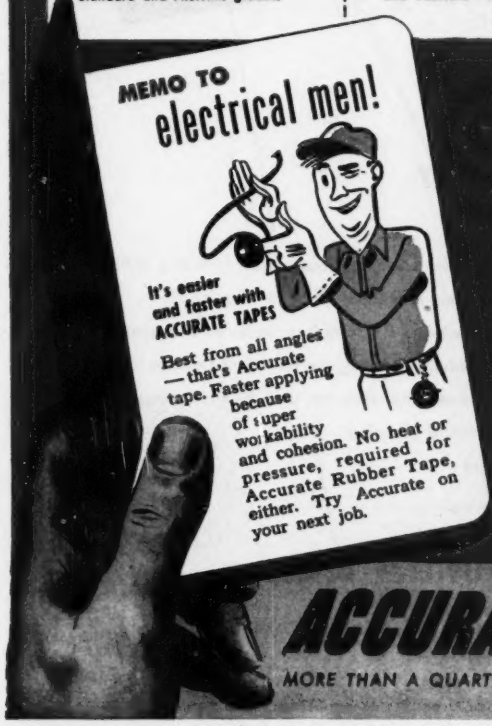
Features the best of material carefully fabricated to provide maximum mechanical protection. Available in Standard and A.S.T.M. grades.

ACCURATE RUBBER TAPE

Offers high elasticity, high dielectric strength and super aging qualities. Made in both Standard grade and A.S.T.M. — A.A.R. Specification

ACCURATE PLASTIC TAPE

Thin caliper plus a combination of good mechanical and dielectric strengths. Recommended for use wherever plastic tape is practical.


MEMO TO
electrical men!
It's easier and faster with ACCURATE TAPES
Best from all angles — that's Accurate tape. Faster applying because of super workability and cohesion. No heat or pressure, required for Accurate Rubber Tape, either. Try Accurate on your next job.

for the electrical industry are manufactured to precision standards by men who have devoted a lifetime to producing tapes of superior quality. Every foot is carefully made and constantly inspected to assure uniform high quality. The sure way to complete tape satisfaction is to specify ACCURATE by name — every time. Get all the facts on ACCURATE Tape now! Just call or write the Accurate Manufacturing Company, Garfield, New Jersey, for new illustrated literature which includes complete specifications and technical data covering the entire ACCURATE line of quality tapes. There is no obligation.

ACCURATE your best buy in tape

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

Utility Executives Endorse Hotpoint's Plan of Action During a Guns and Butter Economy

Geared to the problem of Load-Building and Load-Balancing, Hotpoint's timely program, prepared in chart form, is ready for presentation to utility management.

Operating under a dual economy has presented problems to many businesses, including utilities, which call for a re-appraisal of what we've been doing and a new look at what needs to be done now. In the light of present complex conditions, Hotpoint has prepared a suggested long-range utility promotion program timed for introduction during the period of Defense Mobilization. Those utility executives who have reviewed this program, and the supporting material available for your use, have praised the sound planning that has gone into it. We shall be happy to present it to your organization.

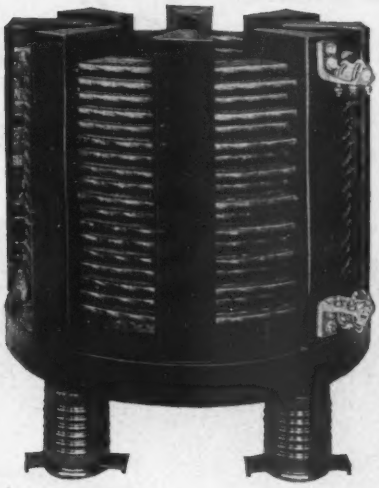
UTILITY DIVISION

Hotpoint Inc.

(A General Electric Affiliate)

5600 West Taylor Street, Chicago 44, Illinois

ASBESTOS FOR THE ELECTRICAL INDUSTRY



General Electric Outdoor Current-Limiting Reactor

Wherever you look in the electrical industry, you'll find asbestos products. A typical instance is shown in the photo: K&M Asbestos Woven Tape used as an outer wrapping for conductor coils.

Inorganic, strong, and flexible, K&M Asbestos Tape readily conforms to irregular contours—provides required protection against heat without deteriorating.

K&M Asbestos Textiles are available in the forms of roving, yarn, thread, cord, tubing, and cloth. These textiles all meet—and in many cases, surpass—A.S.T.M. Standards. Each type is made with the same careful workmanship, under the same strict laboratory control, that have helped K&M maintain its leadership in the field of asbestos textiles for more than 50 years!

Whatever your textile insulation problem, it will pay you to investigate K&M Asbestos Textiles. Write, specifying your needs.

K&M best in asbestos ®

Nature made Asbestos... Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON

COMPANY • AMBLER • PENNSYLVANIA

In Canada: ATLAS ASBESTOS CO., LTD., MONTREAL, TORONTO, WINNIPEG, VANCOUVER

INCLUDE *Wheeler* **REFLECTORS**

IN YOUR **DEFENSE** PRODUCTION PLANS

There's a Wheeler Incandescent or Fluorescent Fixture to meet every industrial requirement.

When defense delivery dates are firm, good lighting is a *must!* Whatever you manufacture . . . bombs or battle jackets . . . tanks or tourniquets . . . you can depend on the greater lighting efficiency of Wheeler Fluorescent Fixtures to help speed production. There's a Wheeler Fluorescent Fixture for every job and every type of plant condition — Wheeler-engineered for ease of installation and proven maintenance savings. Get the complete story — write Wheeler Reflector Co.

275 Congress St., Boston 10, Mass.

Wheeler **REFLECTORS** WHEELER Distributed Exclusively Through Electrical Wholesalers

MADE BY SPECIALISTS IN "SKILLED LIGHTING" **EQUIPMENT SINCE 1881**

today

. . . with *long life* the watch word for Service Entrance Cable . . . you need the permanence of insulations made with FIBERGLAS* Yarns.

Used in OUTER BRAID, MOISTURE-SEAL TAPE and CONDUCTOR COVERING, Fiberglas Yarns help provide—

- high tensile strength with minimum bulk . . . smaller cable that's easier to handle, easier to install!
- resistance to rot, moisture, heat and age . . . cable that lasts *far longer!*

Because of increasing military requirements for Fiberglas Yarns, our customers are unable to get all they need. We are building new facilities to help meet these demands.

OWENS-CORNING
FIBERGLAS
Yarns

*Fiberglas is the trade mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.

FIBERGLAS IS IN YOUR LIFE...FOR GOOD!

Owens-Corning Fiberglas Corporation
Electrical Sales Division
16 E. 56th Street, New York 22, N. Y.

Please send your new booklet describing wires and cables insulated with Fiberglas Yarns.

Name.....

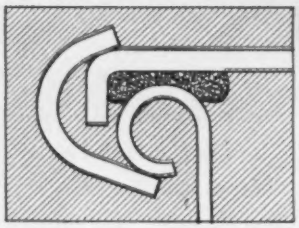
Title.....

Company.....

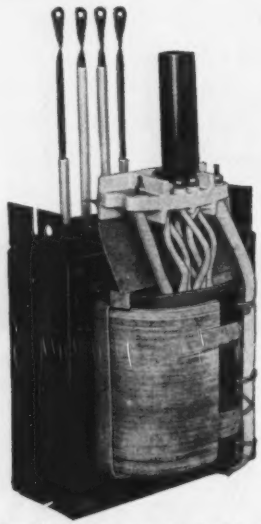
Street.....

City.....*Zone*....*State*.....

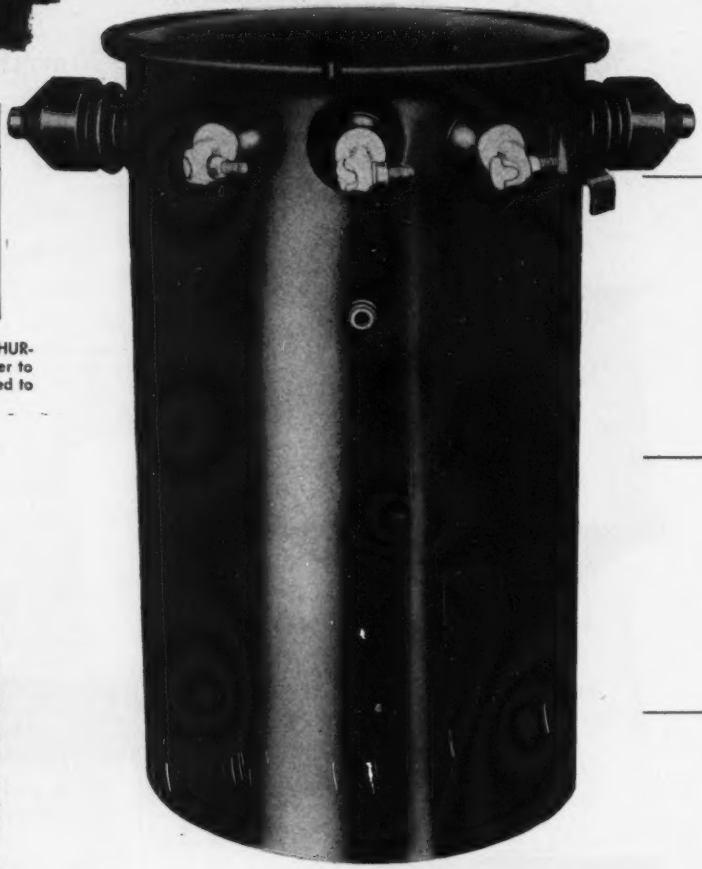
3 REASONS WHY—



Here's how the V-shaped cross section SHUR-SEAL Clamping Ring securely locks the cover to the tank. The Corprene gasket is compressed to assure an air-tight seal.



Form W cores are made of cold rolled, oriented grain steel, properly processed to obtain the lowest practical magnetic losses. The preformed core, assembled in rectangular shape, provides a path for the magnetic flux parallel to the grain of the steel.



Wagner Electric Corporation
1891 1951

Wagner Form W TRANSFORMERS

pay dividends in Extra Service

1 SHUR-SEAL COVER

An entirely new method of fastening the cover to the tank that provides true sealed tank construction. "Breathing" is prevented and no leakage of oil can occur during shipment or handling. The SHUR-SEAL Clamping Ring maintains equal pressure *all around* the cover —yet permits easy removal of the cover by loosening a *single* stainless steel bolt. Drainage channels prevent water from accumulating on the cover.

2 IMPROVED CORE AND COIL DESIGN

Form W elements, with preformed cores of cold rolled, oriented grain steel permit the construction of small size, light weight, yet liberally designed transformers. Form W Transformers are easy to store, to transport, and to mount on poles. They give excellent electrical performance—core and copper losses are low . . . short time overload capacity is high.

3 BUILT TO GIVE EXTRA VALUE

Wagner Form W Transformers are built the Wagner way—with the use of only the highest quality materials, carefully controlled production methods, and the skill acquired in sixty years of transformer building experience. That's why they pay dividends in longer service life.

WAGNER ELECTRIC CORPORATION
6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

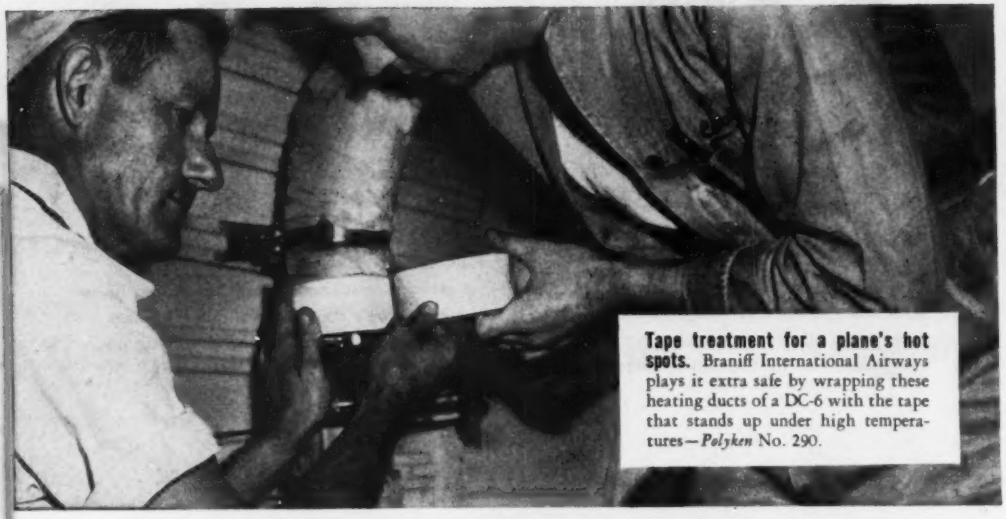
BRANCHES IN 31 PRINCIPAL CITIES

THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB



Tape treatment for a plane's hot spots. Braniff International Airways plays it extra safe by wrapping these heating ducts of a DC-6 with the tape that stands up under high temperatures—*Polyken* No. 290.

At last–a heat duct wrapping as flameproof as glass!

Polyken Tape No. 290 makes such a first-rate wrapping for hot air ducts in planes that it's used exclusively for this purpose by Braniff International Airways.

This amazing new tape combines a Fiberglas* backing with a special flameproof, thermosetting adhesive to produce a heat duct wrapping second to none, withstands temperatures of over 300°. Bear this in mind next time you have a job that's too hot for other tapes to handle, and get yourself *Polyken* No. 290.

Extra strong to begin with, the adhesive qualities of *Polyken* No. 290 actually improve with age, and with increases in temperature. Yet No. 290 *can* be pulled off for overhaul work, and when it comes off it comes off *clean*. High resistance to solvents and moisture. Sticks to any surface as well as its own, and conforms to rough and irregular areas.

Write for free samples of *Polyken* No. 290 today.

*Reg. U.S. Pat. Off. by the Owens-Corning Fiberglas Corp.

FREE SAMPLES. Write now for free engineering and application data, plus samples of *Polyken* No. 290. Address *Polyken*, Dept. EWH, 222 W. Adams St., Chicago 6, Illinois.

Polyken Industrial Tape, Department of Bauer & Black, Division of The Kendall Company

Here is the world's most faulted power system!

This system begins and ends inside our High Power Laboratory. It owns only a few hundred feet of conductors, yet it has been faulted almost 250,000 times—deliberately!

It gets this purposeful punishment because it was erected specifically to serve *you* . . .

For into this miniature system of ours we connect every new interrupting device design. Here they are repeatedly subjected to all fault currents they might be expected to interrupt in actual service. And out of this testing comes the valuable data that enable us to prove . . . and to constantly improve . . . the equipment we build for you.

The testing of high-power circuit breakers provides a good example. The data gained from thousands of actual faults—proving ratings as high as 10,000,000 kva for 230,000 volts—have enabled us to reduce interrupting time, and the size of equipment to do the job. For *you* this means greater system stability and better service continuity. Most important, it means . . . you can always be *sure* when you specify Westinghouse.

High Power Laboratory Developments

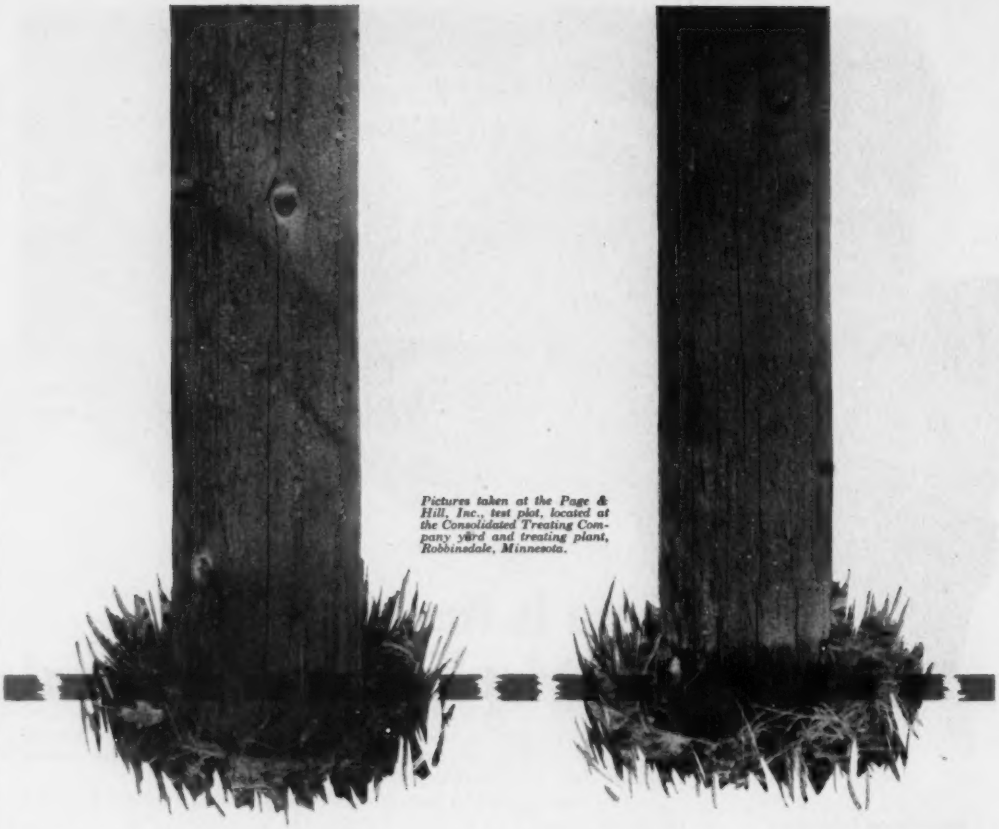
"De-ion®" Grid Interrupters
10,000,000-kva Interrupting Capacity
3 and 5 Cycle Interrupting Time
Reclosing Times as Low as 15 Cycles
Longer Contact Life
Smaller Tanks—Less Oil

SEE "ELECTRICAL PROVING GROUND". *The complete story of 25 years of High-Power Laboratory testing is available to you in sound and color motion picture. Here is an absorbing record of electrical progress . . . dramatic evidence of the way Westinghouse proves for you. For a showing to your group, simply contact your Westinghouse representative or write Westinghouse Electric Corporation, Film Division, P. O. Box 868, Pittsburgh 30, Pennsylvania.* J-60749

YOU CAN BE SURE . . . IF IT'S

Westinghouse

CIRCUIT BREAKERS
WITH "DE-ION" GRIDS



Pictures taken at the Page & Hill, Inc., test plot, located at the Consolidated Treating Company yard and treating plant, Robbinsdale, Minnesota.

Penta preservative protects poles at ground line

Even at the ground line, where utility poles are most severely attacked by decay organisms, Monsanto Penta preservative gives lasting protection.

Proof of this statement is seen in the unretouched photographs above. The untreated pole, at the right, shows damaging effects of decay. The treated pole, at the left, shows no decay . . . even at the ground line! These poles have been standing for ten years in the test yard of Page & Hill, Inc., at the Consolidated Treating Company, Robbinsdale, Minn.

The treated pole was given hot and cold immersion in 5% solution of Monsanto Penta for sufficient time for the timber to retain a half pound of dry penta per cubic foot of sapwood at the ground line and below. The portion above the ground was treated to retain a quarter pound of penta per cubic foot.

Properly formulated penta is a *clean* treatment. It protects poles and crossarms from decay due to fungi and from attack by termites and other wood-boring insects. Penta, a chemical with stability, gives uniform, long-lasting protection. It is insoluble in water and does not leach. Penta treatment does not change dimensions of wood nor corrode common metals.

For detailed information on applying Monsanto Penta to poles, crossarms or other wooden structures, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

WHERE TO USE PENTA PRESERVATIVE

Poles and crossarms • Planks covering underground cables Transformer platforms • Sills and plates • Joists and girders • Screeds and subflooring • Flooring • Roof planks • Platforms and decking • Posts and fences Cooling towers • Millwork • Guardrails • Truck beds Construction timbers.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

a LIGHT job* *well done*

WITH PITTSBURGH PERMAFLECTOR LIGHTING EQUIPMENT

OUTSTANDING! This one word completely describes the illuminating results so easily and successfully achieved at famous Wurzburg, the heart of Grand Rapids. Pittsburgh Permaflector Equipment enabled Wurzburg to plan with imagination and light for their needs. Top performance with "custom designed" appearance was assured. Fluorescent and incandescent units, and combinations of both, meet every lighting requirement.

FOR MORE LIGHTING KNOW-HOW

Write us your lighting interests—stores, offices, banks, buildings or schools. A bulletin covering the subjects will be mailed to you.

PITTSBURGH REFLECTOR COMPANY

408 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

MANUFACTURER OF FLUORESCENT & INCANDESCENT LIGHTING EQUIPMENT

Permaflector Lighting Engineers in All Principal Cities

PITTSBURGH PERMAFLECTOR LIGHTING EQUIPMENT IS DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

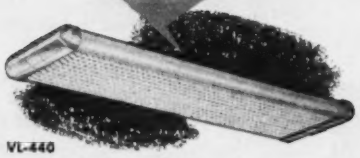
FOR INCREASED EFFICIENCY—

In the Office...

The *RIGHT* Light by LEADER

Industries participating in the new defense program must produce more for less cost in both office and plant. One of the most important factors in more efficient production is better lighting. Leader fluorescent fixtures for every lighting need are properly designed to give large amounts of efficient light without shadow or glare . . . the kind of light modern production requires for efficient operation. There is a Leader unit for every type of installation! Every Leader fixture is of finest quality throughout! For full information on the complete Leader line, write for catalog, TODAY.

In the Plant...



VL-440

The *"Officer"*—Leader's finest fluorescent fixture for all commercial interiors where beauty of appearance is as necessary as lighting efficiency. Available for 2, 3 or 4 40-watt lamps, also for Slimline lamps in lengths from 48" to 96". (VL-240, VL-340, VL-440; NHC-280, NHC-380, NHC-480)

IUO-240

The *"Stratoliner"*— Highly efficient, heavy-duty, all-steel industrial fixture. Removable end caps and turret-type sockets for easy servicing. Open and closed end models for 2 or 3 40-watt or 2 100-watt lamps. (IUO-240, IUO-340, IUO-2-100)

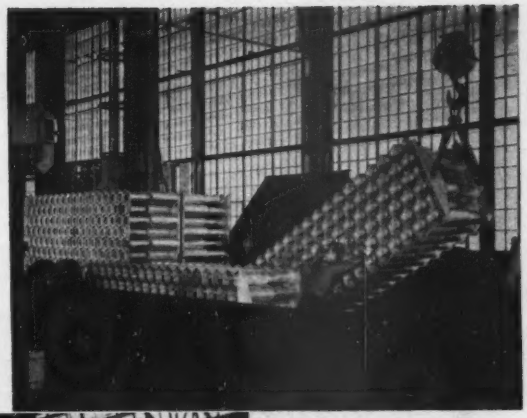
Sold and installed by the better electrical dealers and contractors.

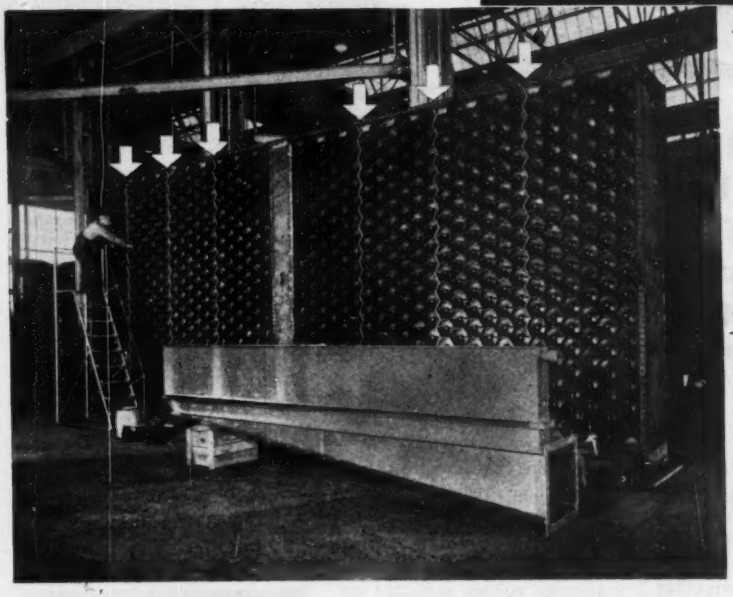
Leader *America's No. 1 Lighting Equipment Manufacturer*

LEADER ELECTRIC COMPANY • 3500 NORTH KEDZIE AVENUE • CHICAGO 18, ILLINOIS
Leader Electric—Western • 800 One Hundredth Avenue • Oakland 2, California
Campbell-Leader, Ltd. • Brantford, Ontario, Canada

America's great public utilities choose American Blower Fly Ash Precipitators

American Blower Fly Ash Precipitators are playing an important part in the expansion programs of many major American public utilities. Years of experience in the power plant field enable us to provide equipment designed and built to handle particular problems efficiently and dependably.



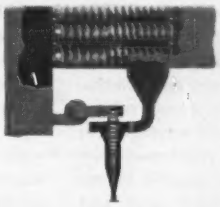


↑ **1. Here are** sections of a *Type ST Fly Ash Precipitator* being loaded into a railroad car. Because the units are furnished partially assembled, they are easier to handle and field erection is simplified. This precipitator will be used on a 690,000# steam/hr. pulverized fuel fired boiler for a flue gas volume of 350,000 cfm.

←**2. Assembled** unit receives final inspection prior to shipment. There are 816 tube elements forming 2 banks. Arrows indicate lines of mating sections which are match-marked to simplify assembly. Depending on the size or terminal velocity of fly ash particles, this Fly Ash Precipitator, when properly installed and operated, will on a normal installation remove from 85 to 90% of the fly ash.

The simple principle of operation of the Type ST Fly Ash Precipitator combines refinement, proportions and methods of construction which result in a more efficient, compact and economical unit.

If you have a fly ash problem and would like further information on American Blower Fly Ash Precipitators, write to our nearest Branch Office and data will be sent to you without obligation.



Principle of Operation

Fly ash laden gases entering main tube are forced to outside by spinner element. This action sets up centrifugal force which concentrates fly ash near tube wall. Cleaned gases in center of tube pass on through outlet tube.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

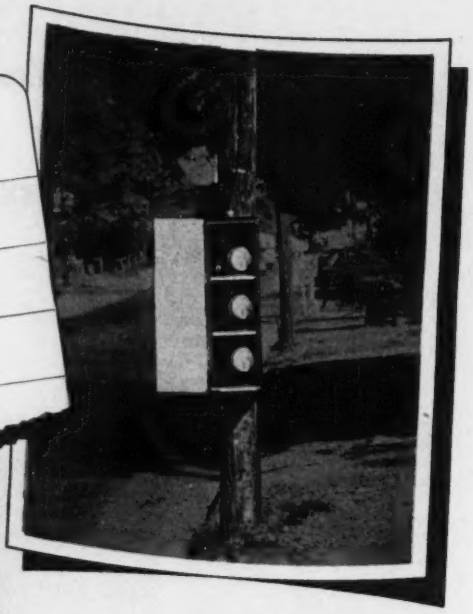
YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Here's How

You can get more watts out of your copper—



This Photo Courtesy of Gulf States Utilities Company, Baton Rouge, La.

MiniMax Voltmeters can be installed in standard meter sockets.

LINCOLN MINIMAX INDICATING VOLTMETERS

...the *Low Cost* way to obtain continuous voltage information

To get the most out of your copper, correct voltage levels must be maintained on the basis of *continuous information.* This information can be obtained through the use of indicating voltmeters mounted at load centers along your system.

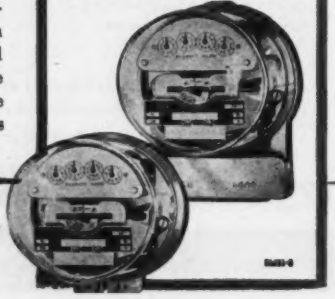
Lincoln MiniMax Indicating Voltmeters provide the most economical way to get the information you need for setting voltage regulators and for solving other voltage control problems. They make the use of graphic meters unnecessary in most cases, and permit inexpensive, *permanent* installations that save the valuable man hours required to make periodic surveys.

The MiniMax voltmeter is equipped with a minimum and a maximum voltage indicator on either side of a pusher pointer which is fixed to the actuating element of the meter. The pointer spreads the indicators apart with changes in voltage. These indicators show the 10-minute averages of minimum and maximum voltages which have occurred since the last resetting. The pointer shows the average voltage at any time. The MiniMax is time lagged so that instantaneous values are not shown.

Bulletin 483 gives full information . . . write for your copy today.

Sangamo J Meters

These watthour meters meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

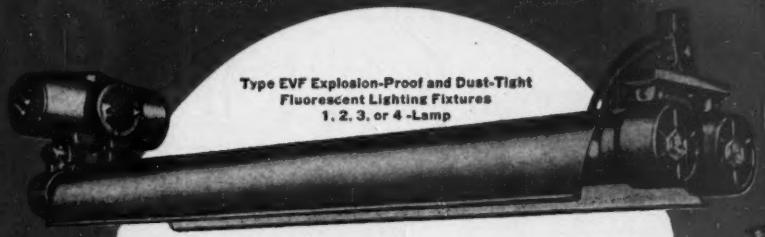


SANGAMO — *Only Measured Facts are Known Facts*

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

CROUSE-HINDS High Efficiency LIGHTING EQUIPMENT...



Type EVF Explosion-Proof and Dust-Tight
Fluorescent Lighting Fixtures
1, 2, 3, or 4 -Lamp

. . . for Hazardous Locations

Crouse-Hinds explosion-proof lighting fixtures exceed the requirements for service in highly explosive atmospheres. They are designed to operate at a temperature below the ignition temperature of the gas-air or vapor-air mixture. They are so strong that they will resist internal explosions without damage and so tight that they will prevent the escape of flames or burning gases which might ignite the surrounding atmosphere.

Crouse-Hinds dust-tight lighting fixtures assure safety in locations that are hazardous because of the presence of combustible dust.

. . . for Wet and Corrosive Location

Crouse-Hinds vaportight lighting fixtures are ideal for use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, non-explosive vapors and gases, or non-combustible dusts.

Hundreds of industrial lighting fixtures are listed in Crouse-Hinds Condulet Catalog.

. . . for Protection

Sabotage thrives in darkness. The most reliable and cheapest form of protection against night prowlers is LIGHT! Crouse-Hinds floodlights project powerful beams of light that bathe all approaches to your property with glaring radiance, killing darkness and shadows and compelling everyone to be more visible at night than in broad daylight.

The protective power of light should be used in all important municipal and industrial locations. The floodlighting of industrial plants serves a double purpose. It helps to boost production in addition to the security it provides.

Send for your copy of Bulletin 2565, "LIGHT! Protect Your Property."

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas
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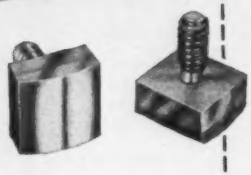
Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

Service Beyond The Sale!

Mallory Research

Perfects Quantity Production Of Tungsten-Faced Stainless Steel Contacts



Years of Mallory research and development are now paying dividends to customers in the availability of Mallory contact assemblies incorporating the combined advantages of tungsten and special steels.

Recently a large aircraft manufacturer had an immediate requirement for tungsten contacts backed with stainless steel. Ordinary brazing technique would destroy the corrosion resistance and hardness of the steel. Mallory's production brazing technique was the only practical solution to the problem and delivery was made without delay . . . with contact assemblies that provided the corrosion resistance of stainless steel and maintained the hardness of the steel within 7 points Rockwell C. The special requirements of a customer were met by a Mallory technique that had been developed for just such a purpose.

That's service beyond the sale!

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you!

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

MALLORY TUNGSTEN CONTACTS

Although all Mallory tungsten is chemically the same, the size, shape and distribution of the grain particles are carefully controlled, since these factors vitally affect its electrical and mechanical properties. Mallory will gladly work with you to find the right contacts to meet your specifications. Write today.

Electrical Contacts and Contact Assemblies

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products
Contacts *Special Metals*
Welding Materials

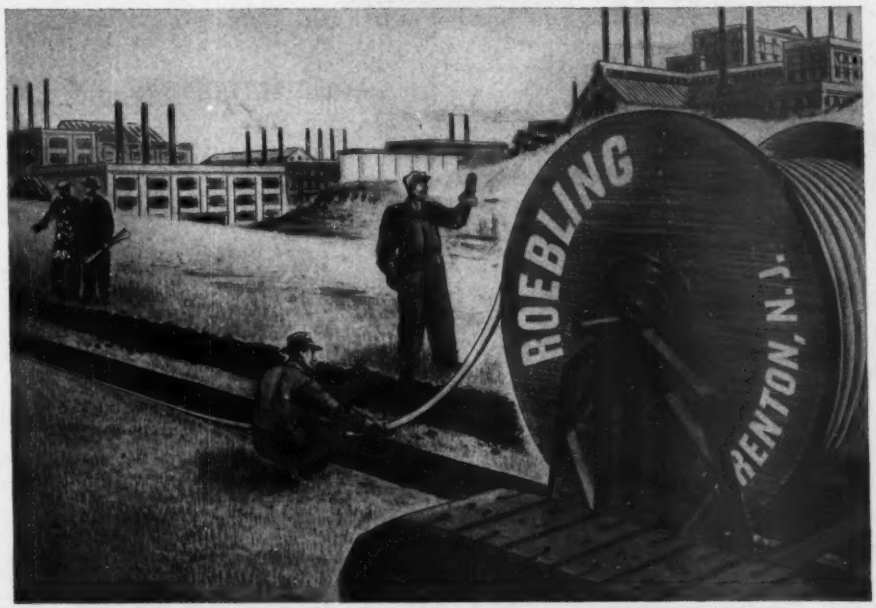
PARKWAY CABLE

Saves the cost of duct systems

FOR GENERAL POWER SUPPLY and distribution circuits, Roebling Parkway Cable is outstandingly efficient and economical. This cable is laid directly in the ground, in a shallow two- or three-foot trench. And after it's installed, Roebling Parkway will give you thoroughly dependable, uninterrupted service – always.

Roebling Parkway Cable is made in both single and multiple conductor types – either solid or stranded – in a range from 600 to 5000 volts. Both types are furnished with metallic armor or with a non-metallic, ROEPRENE sheath which affords full physical protection.

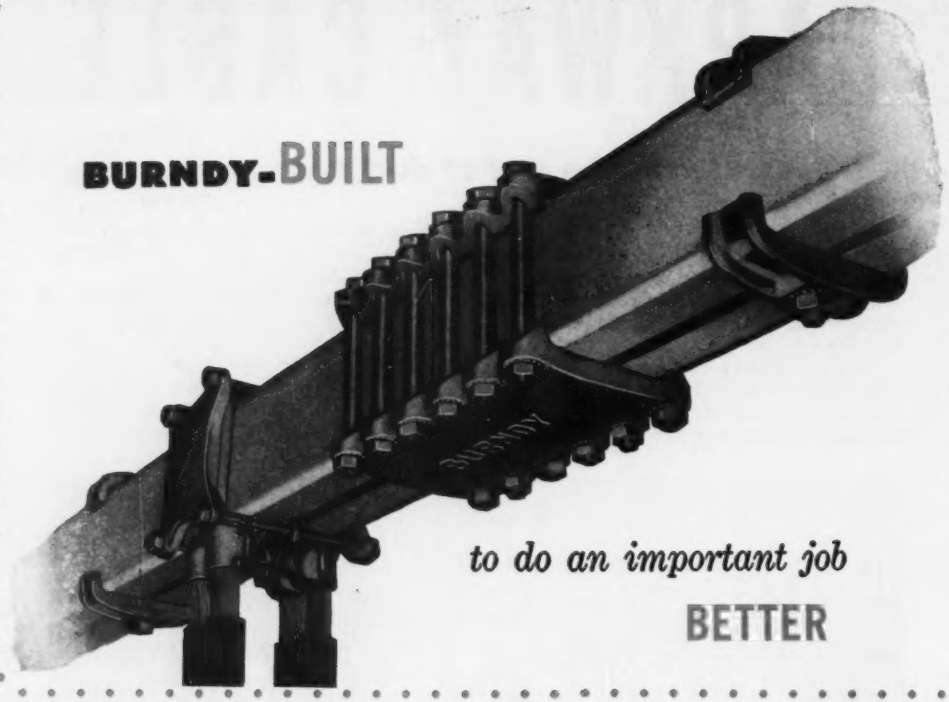
Large quantities of Roebling's complete line of electrical wires and cables are now required in the national rearmament program. You can count on the Roebling organization and Roebling distributors, however, for the best deliveries and service that they can give. John A. Roebling's Sons Company, Trenton 2, New Jersey.



ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***

BURNDY-BUILT



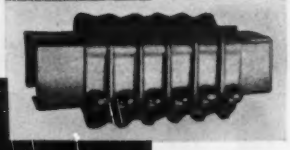
to do an important job

BETTER

special bus shapes . . .

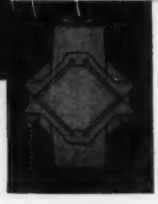
We are in excellent shape to answer your needs. We've got T-connectors, couplers, bus supports, expansion joints. What's more, we've got them for channel, angle and square shape bus. Too, lots of utilities ask us to develop connectors for these special applications. We do it promptly, efficiently. Our engineering department is yours—for the asking. Our Representative too. Call him in on your next problem.

Oval recesses in bolt lugs and oval-shank bolts permit easy, single-wrench installation.



Strategic placement of ribs reinforces strength, provides wrap-around for better contact.

Strong bolts, properly placed for high pressure contact.



Internal lips guarantee accurate positioning on angle and channel bus.

BURNDY

connectors for special shapes

BURNDY, New York 54, N. Y.
Western Branch: Vernon 58, Calif.
Burndy Canada Ltd., Toronto 8, Ontario

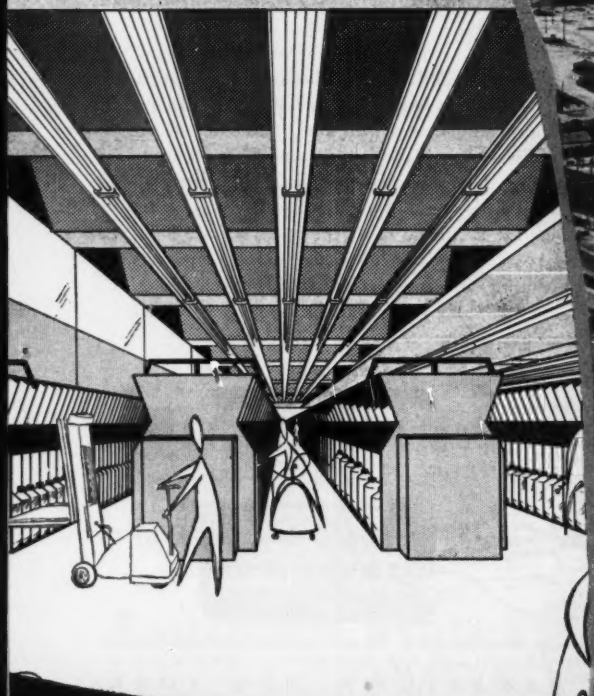
designing an ATOMIC ENERGY PLANT? a TEXTILE MILL?

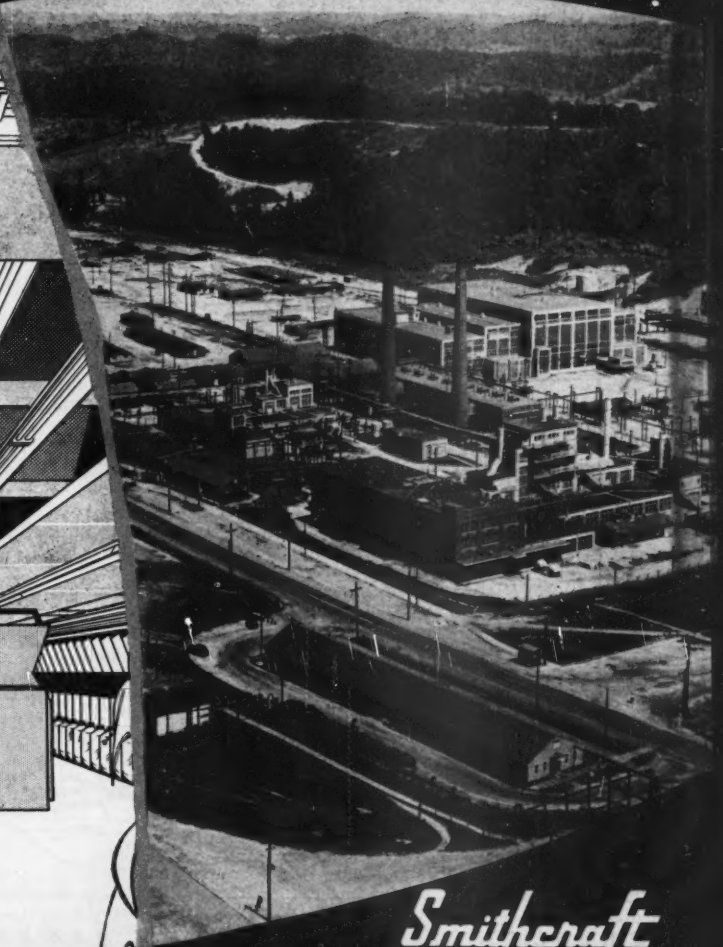
It doesn't matter what the application may be . . . there's a Smithcraft fluorescent fixture for virtually any industrial location. The Oak Ridge Atomic Energy Project, for example, is one of the thousands of installations that utilize "lighting by Smithcraft". Textile mills, machine shops, industrial plants of every description . . . throughout the country, Smithcraft fixtures provide the "better-than-adequate" lighting that's so effective in increasing labor productivity.

There's a reason, of course. We all know that there's more to good lighting than meets the eye . . . and that essential "more" is provided by Smithcraft's features of design and manufacture. These features assure ease of installation, ease of maintenance, and long-term trouble-free service, as well as unexcelled lighting performance.

We've compiled descriptive folders and specification sheets on every Smithcraft fluorescent fixture into a bound catalog that's yours for the asking. Write for your copy today. You'll see why "America's Finest Fluorescent Fixtures" are products of "Smithcraft".

. . . Textile mill . . . . . Oak Ridge Atomic Energy Project . . .



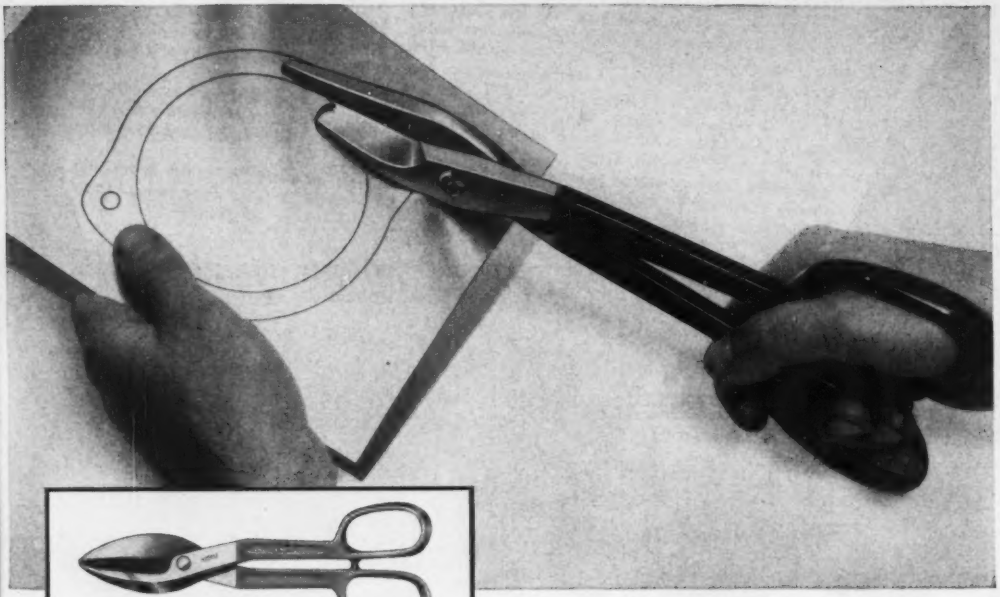


America's finest fluorescent fixtures by . . Smithcraft

LIGHTING DIVISION

CHELSEA 50 MASSACHUSETTS

INTRICATE SHEET METAL CUTTING IS EASY WITH CRESCENT SNIPS



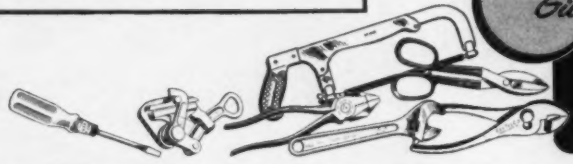
Standard Pattern Snips
No. S412—12¾". Also 7 other sizes from 7" to 14".

Circular Cutting Snips
No. T412—12¾".
Also available in 7" size.

Combination Pattern Snips
No. U412—12¾" only.

Heavy Duty Snips
No. U416—16¼" only.

● These are CRESCENT Circular Cutting Snips, No. T-412. Not only will they follow curved lines and intricate patterns with ease . . . but the shearing power of their specially ground blades is really amazing. Like all Crescent Snips, the entire tool is a solid forging of special analysis steel. Cutting edges are *not* inlaid in the blades. They are hardened by Crescent's own Selective Induction process to insure satisfactory performance through a long, useful life. Sold by Hardware Dealers and Industrial Distributors everywhere.



CRESCENT TOOLS
Give Wings to Work

Sign of the Artisan
Symbol of Excellence

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

SAFETY plus

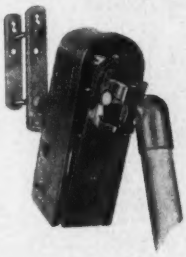
with the PE 33

FULLY HOOKSTICK OPERATED

SS BAYONET HEAD HOOKSTICK

opening or closing

CONVENTIONAL HOOKSTICK



opening or closing

removing or installing

To install or remove door with bayonet type hookstick, insert point of hookstick head in socket of combination hook ring. Door can be safely and easily lifted out or replaced.

removing or installing

To install or remove door with conventional type hookstick, place hook under bottom contact spring. Door can be lifted out by lineman from a point of safety.

Southern States Porcelain-Enclosed Dropout Cutout

5 kv 50 amp
1200 amp int. cap.

Safety Features

- The door swings open through 180° when the link is blown, completely isolating it from live parts. The door can be safely removed by hand.
- The PE-33 door can be opened, closed, removed or replaced by ANY hookstick.
- Brown glazed high strength wet process porcelain body is designed for minimum leakage and maximum flashover characteristics. THERE ARE NO EXPOSED LIVE PARTS.
- NEMA and EEI approved mounting bracket of galvanized steel strap is strong enough to withstand the most severe operating shocks.
- Extra-heavy duty plastic door is ribbed for greater strength and reinforced at ring section.

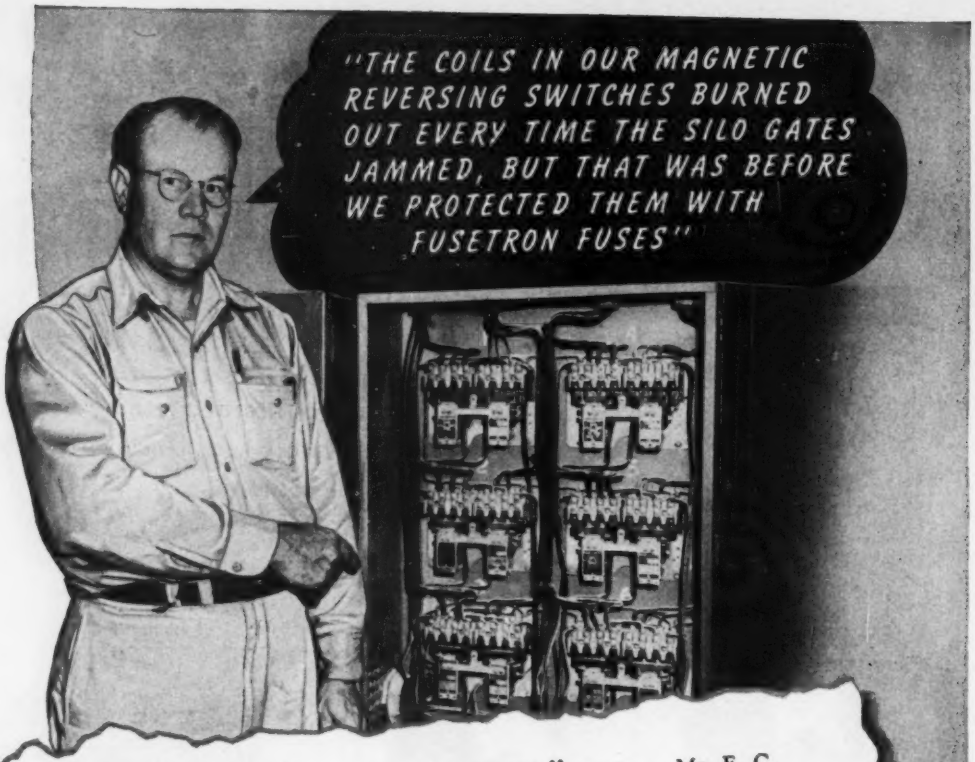
Meets NEMA, ASA and AIEE standards.

FOR FULL INFORMATION, WRITE FOR BULLETIN NO. 178-PE

PRESENTLY AVAILABLE FROM STOCK
SUBJECT TO PRIOR SALE

Southern States Equipment Corp.

HAMPTON GEORGIA


"THE COILS IN OUR MAGNETIC REVERSING SWITCHES BURNED OUT EVERY TIME THE SILO GATES JAMMED, BUT THAT WAS BEFORE WE PROTECTED THEM WITH FUSETRON FUSES"

"Sure! *you can quote me,*" continues Mr. E. C. Willy, Chief Electrician, H. J. Kaiser Co., Radum Plant, Pleasanton, Calif.

"In the past, we found magnetic reversing switches welded the main contacts when Silo Gates jammed. When reverse control operated, the armature could not properly engage, resulting in a burned out coil.

"The coils cost about $4.00 each, but most important was the substantial production loss each time the coil burned out.

"We now have 4/10 ampere Fusetron dual-element fuses installed to protect these coils. During the year 1950 we blew about 100 Fusetron fuses, but didn't lo se any coils. This represents a saving of at least $400.00 in coils and kept me from being dragged out of bed at night, an occurrence that often happened before. Then, too, we can replace burned out Fusetron fuses much faster than we can replace coils, to say nothing of the valuable production time we save."

Facts about Fusetron *dual-element* Fuses

- The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.
- They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.
- Made to the same dimensions as ordinary fuses — fit all standard fuse holders.
- Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.
- Their cost is surprisingly low.

FUSETRON

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION

BUSS

"You too, can get 10 Point Protection by using Fusetron (DUAL-ELEMENT) Fuses"

1* Protect against short-circuits.

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexpensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

★ Fusetron Fuses have high interrupting capacity as shown by tests of Electrical Testing Laboratories of New York City in December 1947.

Don't Risk Losses!

One **destroyed** switch or panel . . .
One **needless** shutdown . . .
One **lost** motor . . .

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

Mail the Coupon Now!

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name_____

Title_____

Company_____

Address_____

City and Zone_____ State_____ 851

For MAXIMUM SERVICE CONTINUITY

Transfer Loads with G&W AUTOMATIC LOAD BREAK OIL SWITCHES

When even short interruptions of electric service can be very costly and inconvenient, an alternate power source and a means of instantaneous switching must be provided to assure service continuity.

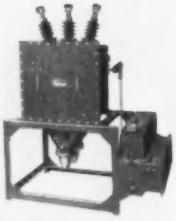
G & W automatic load break oil switches furnish relatively inexpensive insurance against interruption of service when an alternate feeder is available. They will automatically transfer load to an alternate feeder whenever the preferred feeder voltage drops to 65% of normal.

5,000, 7,500, and 15,000 volt switches are made with two types of automatic mechanisms to meet individual requirements.

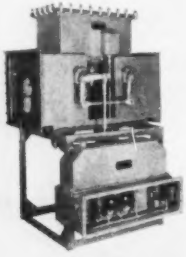
AUTOMATIC THROWOVER TO EMERGENCY FEEDER MANUAL THROWBACK TO PREFERRED FEEDER

This double-throw switch with Model "A" automatic operating mechanism will transfer load to the emergency feeder in a fraction of a second when the preferred feeder voltage drops to 65% of normal. A detachable handle is used to return load to the preferred feeder and reset the mechanism after the preferred feeder is re-energized.

AUTOMATIC THROWOVER TO EMERGENCY FEEDER AUTOMATIC THROWBACK TO PREFERRED FEEDER



Fully automatic operation is obtained with this double-throw switch equipped with Model "E" transfer mechanism. Restoration of preferred feeder energizes a control circuit to return load to preferred feeder 2½ minutes after it is re-energized.



Two single-throw load break oil switches with link compartment and Model "E" automatic operating mechanism assure full service continuity with no sacrifice in accessibility to feeders for repair or routine maintenance. Links permit easy isolation of either switch and connected feeder without interrupting service to the load from the other feeder.

Write for Your Copy of Bulletin DA50—Full Descriptions of Automatic Load Break Oil Switches.

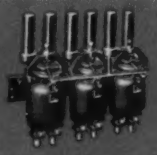
Use G & W Cable Accessories for
TERMINATING
FUSING—SWITCHING
SPLICING—CONNECTING

POTHEADS

Trouble-Free Cable Terminations
Capnut Style Disconnecting Straight Through
Write for Bulletin AB51

Type "ST-SODERTITE"—*Bulletin AA50*

OIL FUSE CUTOUTS



Single or Gang Operated Fuse-Switch Units
Write for Bulletin CA51

CABLE BOXES

Air or Oil Filled
Fuses, Links or Direct Connection

Many Sizes, Styles, Ratings

UNIT SPLICING KITS

Packaged Materials for Properly Designed Joints for all Types of Cables
Write for Bulletin J50

G&W ELECTRIC SPECIALTY COMPANY
7780 DANTE AVENUE • CHICAGO 19, ILLINOIS, U.S.A.
Representatives in principal cities. In Canada, Powerlite Devices, Ltd., Toronto

Whatever your utility body needs may be . . . from a set of compartment sections for a pick-up truck to a line body capable of handling the largest construction job . . . there's a POWERS-American Body designed to meet your requirements.

Available for construction, maintenance, and service work in all phases of the public utility industry, POWERS-American Bodies are "job-engineered" to step up crew efficiency and lower operation costs. Their quality construction guarantees long life and trouble-free service.

Whether your needs be large or small, standard or special, you'll find it a real economy to call POWERS-American . . . the 1 source for all types of utility bodies and equipment.

Look at all the features you get in POWERS-American Bodies

"Job-engineered" design • Equalized load distribution • Extra large weathertight compartments • Triple-seal compartment doors • Recessed slam-action door catches, with cylinder locks keyed alike • Additional line body features include: low-positioned rubber goods compartment • Full-size compartments on street side • Derrick stowed without interference to cab door or loss of compartment space • Extra depth in all compartments • Horizontal compartments for long material.

"THE ACCEPTED STANDARD WITH UTILITIES EVERYWHERE"

POWERS *American* DIVISION

ACF

PUBLIC UTILITY BODIES AND EQUIPMENT

McCABE POWERS AUTO BODY CO., 3900 N. BROADWAY • St. Louis 15, Mo.

Sales Representatives in Principal Cities

Dependable, Permanent Grounding!

BLACKBURN *Copper-Bonded* GROUND ROD

Completely Covered - - -

Molecularly Bonded to

Steel Core---To Insure

Lasting Protection

Note uniform copper covering, molecularly bonded to steel core. Cross section of copper is greater than No. 4 wire. Both point and driving end completely covered to totally protect steel.

For Your Protection!

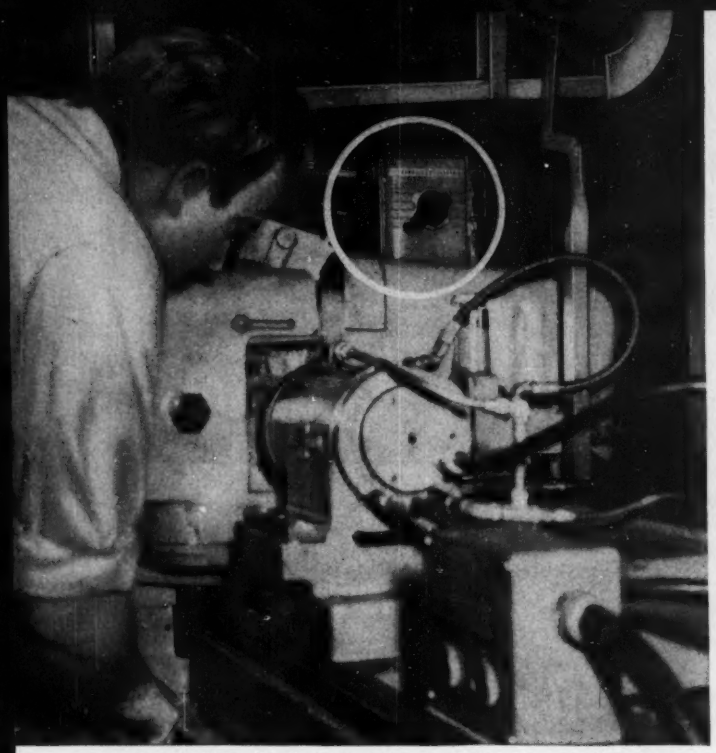
Here is a quality ground rod from a reliable mid-western source — a stable, dependable source of supply — a strategically located source for quick shipment to central, southern and western sections of the country.

For your convenience BLACKBURN maintains numerous, conveniently-located jobber stocks, backed up by factory shipments from St. Louis.

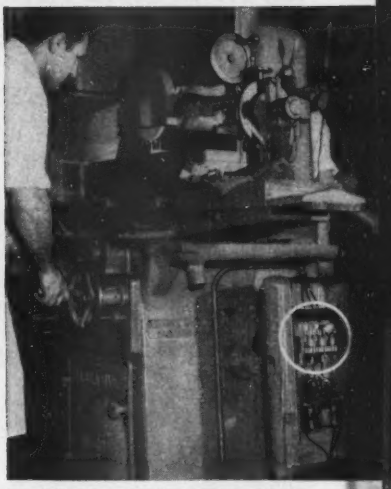
For a dependable source of a truly quality rod specify BLACKBURN when you order.

Distributed on the West Coast by
KORTICK MANUFACTURING CO.

JASPER BLACKBURN PRODUCTS CORP.
FIRST, MADISON & CLINTON STS.
St. Louis 6, Mo. · Phone CEntral 3007
BUILDERS OF QUALITY PRODUCTS



IN SAFETY SWITCHES—Marlin-Rockwell Corporation's ball bearing factories use 30 ampere HCI switches as disconnects for high frequency motors used to power internal grinders. HCI interior is removable for easy wiring and inspection. No exposed live parts when switch is OFF and door open. Underwriters' Laboratories Approved.



IN COMBINATION STARTERS—Rugged, simple construction of HCI is perfectly adapted to use as disconnect in combination starters.

SAFE LOAD BREAKING

with Unique "Arc-Quench" Action

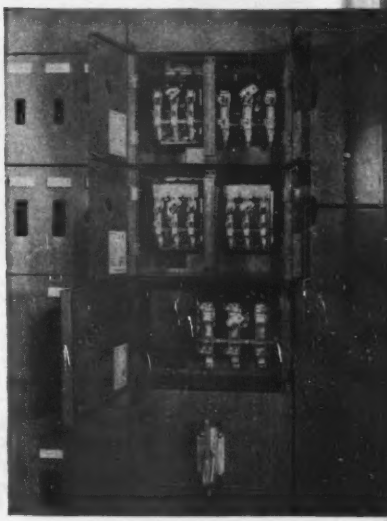
For the first time in a safety switch, magnetic repulsion is used to break load quickly, safely.

In Trumbull's HCI (High Capacity Interrupter) Type A switch, double-break contacts are projected and withdrawn with piston-like speed and force. The arcs repel each other and strike against grid pins, breaking into smaller arcs which cool rapidly.

The unique arc-quenching action provides safety, lengthens contact life by preventing pitting, and gives the switch much greater life expectancy. HCI withstands heavy short circuits without damage.

Its initial success as a safety switch has led to its adoption for use as disconnect in combination starters, control centers and switchboards.

Write for Bulletin TEC-10 which describes the HCI fully.



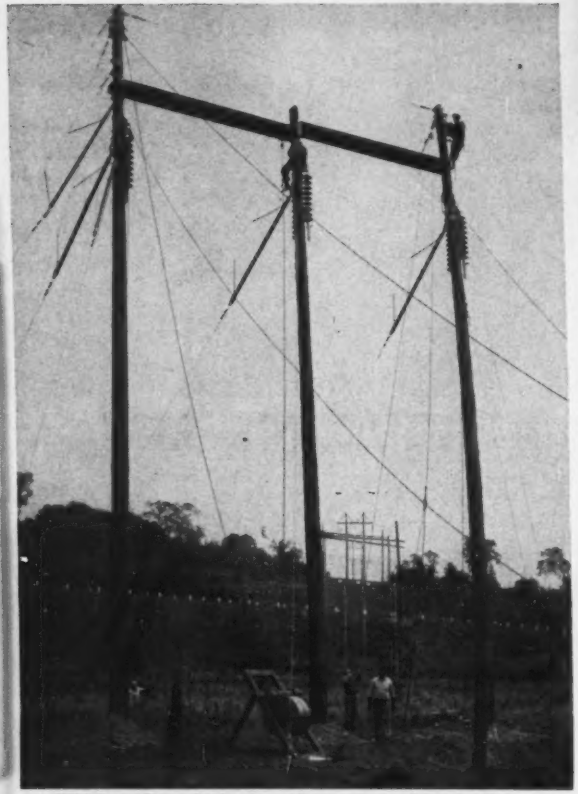
IN SWITCHBOARDS AND CONTROL CENTERS—Compact 30 and 60 ampere HCI switch interiors can be mounted in twin switchboard units (100 ampere HCI takes same vertical space), saving trough space and providing dependable short-circuit protection and sure ON-OFF handle indication.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

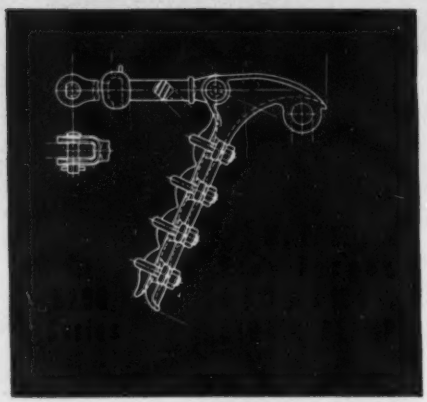
VITAL LINK

in N. Y. State Electric & Gas Corp. Interconnected Transmission System



• BTC Drop Forged Aluminum Suspension and Strain Clamps were used on this 3-pole angle deadend structure, shown here in the process of construction.

Why not specify BTC Drop Forged Clamps and Fittings for your own transmission lines. Sold only through your insulator manufacturer.



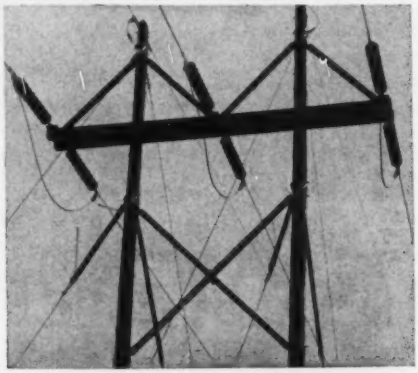
This high-capacity line plays an important role in New York State Electric and Gas Corporation's 114 kv. interconnected transmission system. Thirty-two miles long, it ties two steam generating stations into a system serving a wide portion of southern New York.

The line, which was erected in 1950, employs a 477,000 cm. A.C.S.R. conductor, the largest in diameter and the heaviest in weight per foot of any in the company's system. Special rigging and equipment were required to string the line and pull it to its proper sag. Overhead ground wires consist of ⅜" EHS Copperweld.

During construction of the line, a highway was raised near one 70 ft. tower. As a result, the tower had to be elevated 20 ft. to obtain standard ground clearance. This was done, without dismantling, with the aid of two portable derricks. While the tower was suspended in the air, a 20 ft. steel extension was assembled underneath — the entire operation taking slightly less than two hours.

This was one of the first N. Y. State Electric and Gas lines to use Aluminum Suspension and Strain Clamps. The BTC Drop Forged Aluminum M.P.L. (Minimum Power Loss) Clamps — plus other BTC insulator hardware — were selected on the basis of their easy installation and efficient, trouble-free performance. They are helping to keep maintenance at a minimum on this vital link in the company's interconnected transmission system.

• This tangent deadend structure, part of New York State Electric and Gas Corporation's interconnected transmission system, illustrates BTC Drop Forged Clamps and Fittings in use.



Drop Forged BTC Hi-Line Hardware

The BREWER-TITCHENER Corporation

Cortland • New York

MAKE LIGHTING LINES AID PRODUCTION LINES

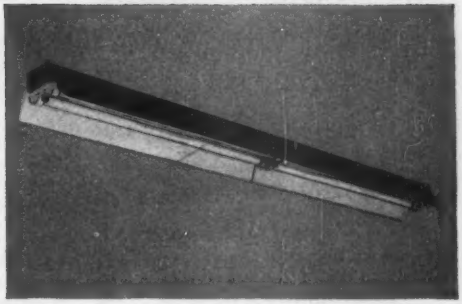
Sylvania Fluorescent Fixtures provide abundant, glare-free light in new Kaiser-Frazer plant, Portland, Oregon

Unbroken lines of light which follow the production process, together with continuous wireways, are readily possible with Sylvania Fluorescent Fixtures.

These fixtures are *engineered* for efficient lighting and trouble-free operation. The durable finish of either porcelain enamel or long-lasting "Miracoat" enamel provides a smooth surface of maximum reflectivity. Turned-down lip construction prevents accumulation of dust, lint, or moisture.

Easy installation and low maintenance costs are other good reasons why Sylvania fixtures *win and keep* your clients' good will.

Now you'll find Sylvania Industrial Fluorescent Fixtures available in sizes and types for every need. The coupon brings you new illustrated folder showing the entire line. Mail it NOW.



This is the Sylvania HFFS-440. The 1300 fixtures of this type in the K-F installation, (above) mounted in continuous rows on 9' 6" centers, provide a lighting level of 60 foot-candles.

SYLVANIA

FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

SYLVANIA ELECTRIC PRODUCTS INC. 1901–1951 50th ANNIVERSARY FIVE DECADES OF PROGRESS

Sylvania Electric Products Inc.
Dept. L-7108, 1740 Broadway,
New York 19, N. Y.
Please send me illustrated folder describing the full line of Sylvania Fluorescent Industrial Fixtures.

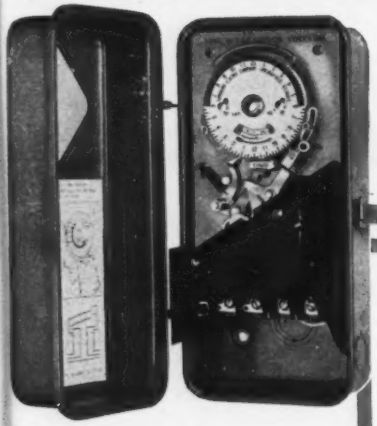
*Name*_____
*Company*_____
*Street*_____
*City*_____ *Zone*____ *State*_____

SANGAMO the Time Switch with the *Automatic Memory* . . .

A Sangamo Astronomic Time Switch controls the circuits for the protective flood and yard lighting in this defense factory. Other types are available for practically any conceivable industrial use.

is often the answer to the timing needs OF INDUSTRIAL PLANTS

The growing shortage of available industrial manpower makes automatic devices with which to control manufacturing processes more important than ever. The Sangamo Time Switch is such a device. It will solve practically any problem concerning daily sequence timing in industry. Protective floodlighting control is a typical example where the Sangamo Time Switch eliminates the need for human attendance. So is the use of these switches for the control of pre-heating before workshifts, or the continuance of certain process cycles after workshifts. Below are a few suggestions where Sangamo Time Switches can serve industry.



The operation of this Sangamo Astronomic Time Switch automatically compensates daily in accordance with sunset and sunrise.

INDUSTRIAL APPLICATIONS

For daily pre-heating:

Lead pots for solder operations.
Zinc for injection molding.
Type metal in type foundries.
Dies in plastic molding presses.
Glue in woodworking shops.
Tanks for galvanize dipping.
Electric ovens and furnaces.
Infra-red paint dryers.
Electronic testing equipment.
Soldering irons on assembly lines.

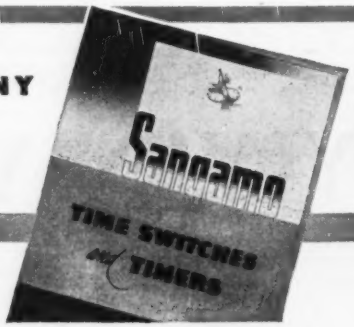
For daily circuit control:

Yard floodlights.
Runway and hall lights.
Electric factory signs.
Pumps, compressors.
Water softeners.
Mixing equipment.
Electric doors and gates.
Air conditioning.
Alarm systems.
Exhaust fans.
Electric valves.
Two-level thermostats.

SANGAMO ELECTRIC COMPANY

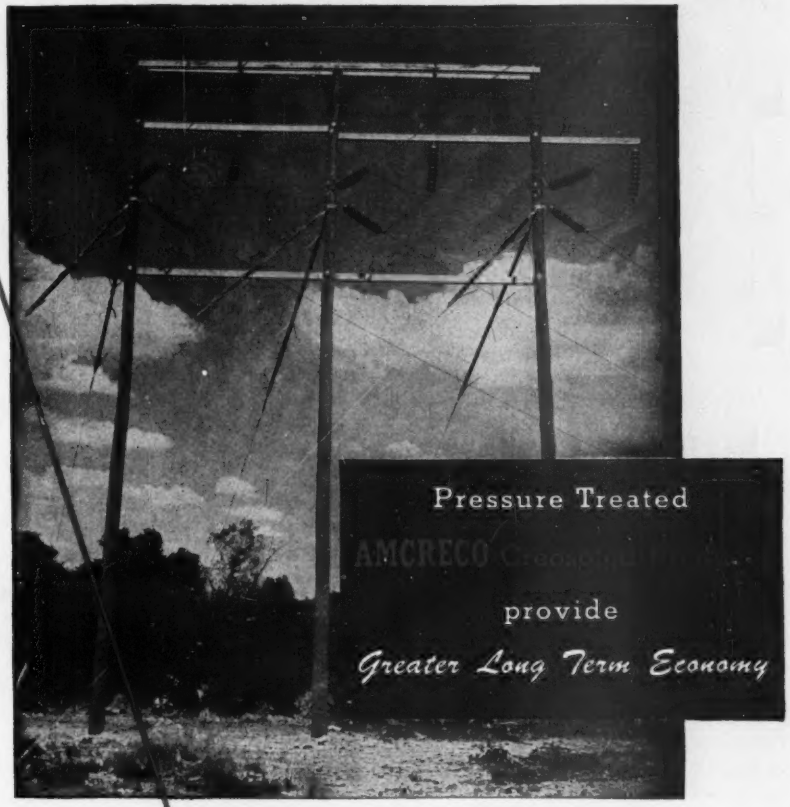
SPRINGFIELD, ILLINOIS

Get the full story—write for Catalog today.



ST51-7

THE PROOF *is in the service records!*

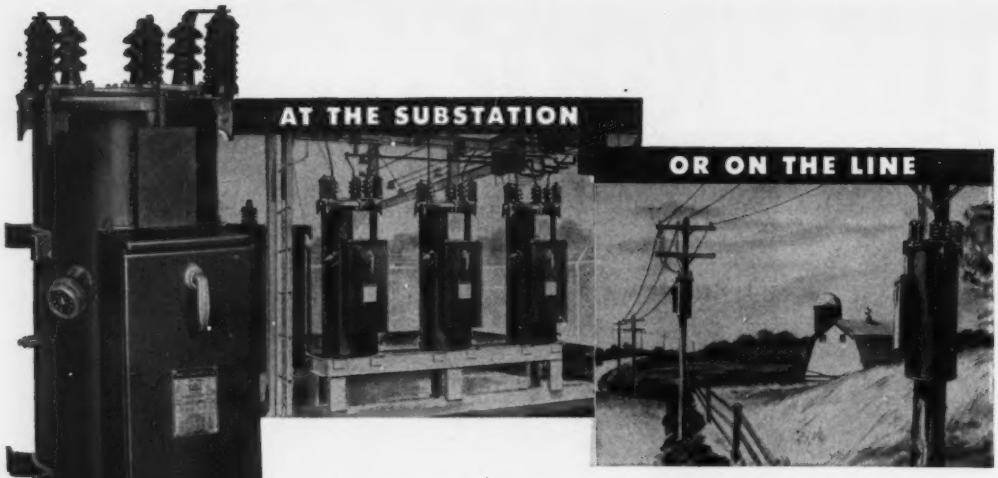


There is no better proof of the superiority of Amcreco Poles, Cross Arms and Conduit than the actual service records. It is the best indication of the long pole life and freedom from maintenance troubles for users of Amcreco. We will be pleased to show you typical service records and point out how Amcreco can reduce your cost per pole per year. Write today.

Amcreco
Lowry Process
Creosoted Products

AMERICAN CREOSOTING COMPANY
INCORPORATED
COLONIAL CREOSOTING COMPANY INCORPORATED
AMCREO LOWRY PROCESS
GEORGIA CREOSOTING COMPANY INCORPORATED
LOUISVILLE, KENTUCKY

POLES • CROSS ARMS • CONDUIT



±10% Regulation... in Sixteen 1¼% Steps

with New URL-16 Voltage Regulator — An Important Addition to the URL-8 Line

ASSURES MORE REVENUE FROM HEAVILY LOADED RURAL AREAS

Here's a new, low-cost answer to economical regulation in rural or suburban areas . . . at the substation or on the line. This new regulator increases the "URL" line for application in locations where a 10% range is not sufficient, and where a ±10% regulator is required. Sixteen 1¼% step operation meets these requirements under any load condition, at minimum cost.

Check these moneysaving features:

10% Regulation, Raise and Lower, in 16 Steps of 1¼% Each—Combines light weight for single-pole mounting with regulation for substation application. A double-purpose feature that cuts costs. Regulator retains every outstanding "URL" feature.

Simple Tap Changer, with Reversing Switch for ±10% Regulation—Cuts maintenance. Assures positive arc interruption and minimum voltage variation during tap changing period.

Package Control Mounted in Improved Control Cabinet—Operating relays are mounted in flexitest chassis. Separate resistance and reactance line drop compensator provides rated line drop compensation with regulator carrying only 67% rated load. All mounted in a cabinet with door hinged to provide workbench when fully opened.

For Further Information, call your Westinghouse representative, or write. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70602

YOU CAN BE SURE... IF IT'S
Westinghouse

VOLTAGE REGULATORS

Here's a Strand You DON'T Have to Seize

"Like that feature? Me too. Seizing is always a nuisance and a time-waster. We got clear of it when they gave us Form-Set strand to work with. Look, this piece of Form-Set I'm holding was cut without seizing. Not a wire out of place. Notice how easily I can slip it into the fitting?"

It's no accident that Bethlehem Form-Set strand is easier to handle. Form-Set is preformed; each individual wire is given its permanent curl before it goes into the strand. This has the effect of relieving internal tension, so that the wires ***can't*** spring apart when the strand is cut.

That's why seizing isn't needed. That's why you don't have stubborn wires to pinch together. Easier handling . . . saving of time . . . these are the ***big*** advantages you get with Form-Set.

It's inexpensive, too; costs little more than ordinary strand. By any method of figuring, it's a good sound purchase. Want complete details? Let us know and we'll gladly see that full information is furnished you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

1873 THOMAS INSULATORS our 78th year RELIABILITY 1951

DEMAND *Proof* OF PERFORMANCE

1907

Fig. 1—In 1907, THOMAS was FIRST with the CAP-AND-PIN Suspension Insulator.

1951

Fig. 2—In 1951, THOMAS is STILL the Standard of Comparison.

Fig. 3—Typical "Quiet-Type" Insulator*.

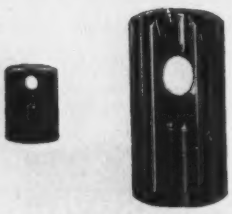


Fig. 4—Guy-Strain Insulators

Let us repeat, "All insulators are not alike". To make an insulator that will do its job the trouble-free way . . . over a span of many years . . . requires EXPERIENCE. Thomas has that experience.

Since the beginning of the Electrical Industry, Thomas has consistently kept pace with the Industry's astonishing growth. Two early mileposts in our progress come to mind.

In 1893, all of the porcelains used in the lighting arrangement for the World's Fair at Chicago were Thomas.

In 1907, Thomas designed and made the first Cap-and-Pin Suspension Insulator. UNITS INSTALLED THAT YEAR ARE STILL GIVING TROUBLE-FREE SERVICE AFTER 44 YEARS OF CONTINUOUS OPERATION.

More recently, Thomas pioneered and patented a complete line of "Quiet-Type"* Insulators which are guaranteed to eliminate insulator radio interference.

These are among the many Thomas "Firsts" and contributions which have helped the Electrical Industry reach its present position.

TODAY, in our 78th year, we are ready with improved facilities and increased capacity to meet the most exacting needs of the Industry. After all is said . . . it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Why gamble?

*Patent No. 2154387

Fig. 5—Pin-Type Insulators

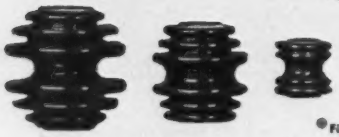
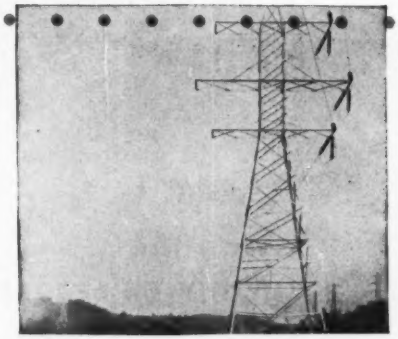


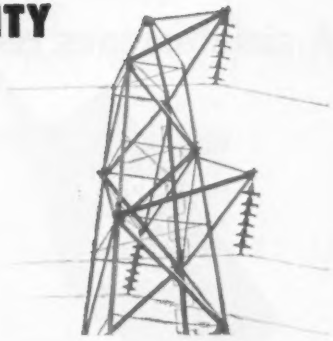
Fig. 6—Spool Insulators.

ENGINEERS, MANUFACTURERS AND DESIGNERS SINCE 1873

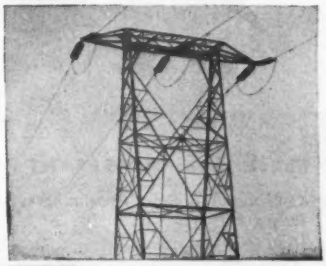
FOR SUPERIOR INSULATOR QUALITY



1931 ● Fig. 7—2660-foot span of 69-mile, 132-kv line equipped with Thomas insulators installed in 1931.



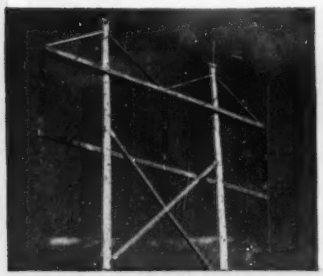
1907 ● Fig. 8—Central California line on which Cap-and-Pin insulators were first used in 1907.



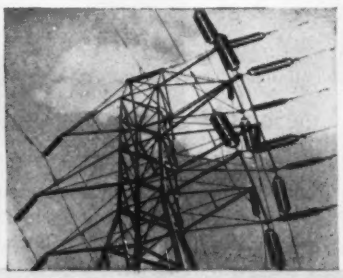
1938 ● Fig. 9—Large Western 230-kv line using 50,000 Thomas insulators installed in 1938.

Specify Thomas Insulators - The Best by Line Test

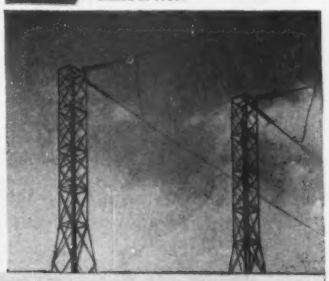
The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin-type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, preformed armor rods, and so on.



1948 ● Fig. 10—43,000 Thomas insulators are installed on this 230-kv, 189-mile line.



1949 ● Fig. 11—5,000 Thomas insulator make certain that this 132-kv, 14-mile line will give satisfactory service for decades to come.



1950 ● Fig. 12—On right-angle towers, Thomas insulators have the stamina that assures long life and trouble-free performance.

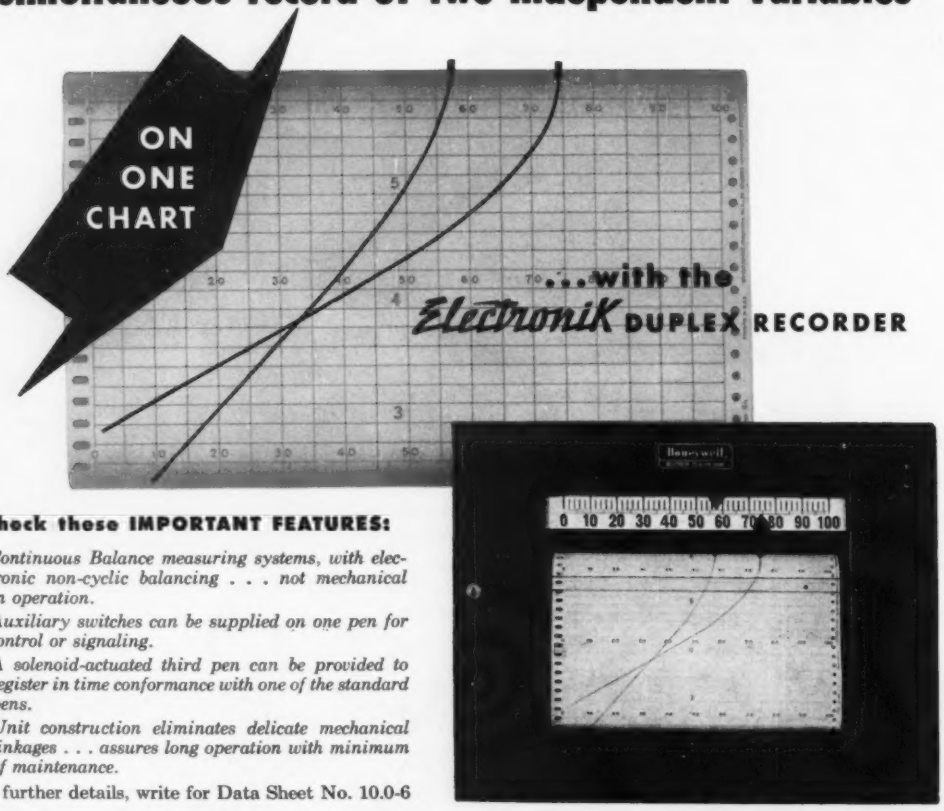
The R. Thomas and Sons Co.

LISBON, OHIO

NEW YORK CHICAGO

Sales Representatives: E. B. Anderson Co., *Detroit* • Paul Berry, *Oklahoma City* • Ken H. Best, *Seattle* • Butler & Land, *Dallas* • R. E. Cunningham & Son, *Los Angeles* • Electric Supply Co., *Albuquerque* • Engineer Sales Corp., *St. Petersburg* • R. F. Hamilton & Associates, *Denver* • R. H. Harper, *St. Louis* • Geo. E. Henn Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • Lynn Elliott Company, *Houston* • W. C. Milburn, *Chattanooga* • John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • Redmond Supply Co., *Phoenix* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan & Company, *Boston* • Walter E. Thompson, *Birmingham* • E. E. Torkell, *Memphis* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Joe Williams, *Little Rock* • *Representatives in other principal cities*

A simultaneous record of two independent variables



Check these IMPORTANT FEATURES:

- √ *Continuous Balance measuring systems, with electronic non-cyclic balancing . . . not mechanical in operation.*
- √ *Auxiliary switches can be supplied on one pen for control or signaling.*
- √ *A solenoid-actuated third pen can be provided to register in time conformance with one of the standard pens.*
- √ *Unit construction eliminates delicate mechanical linkages . . . assures long operation with minimum of maintenance.*

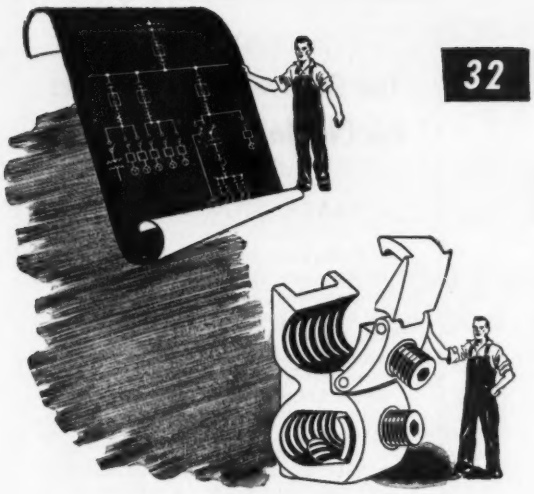
For further details, write for Data Sheet No. 10.0-6

THE opportunity for such recording facilitates many analyses and operating procedures involving comparison measurements. For instance . . . the deviation of watts, vars or frequency from a control point or given standard can be continuously recorded. One pen can record a KW load called for by the dispatcher, while the other pen records the actual load on the line.

Operating on the "continuous balance" principle, the recorder incorporates two independent measuring systems . . . both standardized simultaneously by the push of a button. Each pen traverses the full eleven inches of the chart width without interference. Simplicity, sensitivity and dependability make this versatile instrument a "natural" for central station and systems applications.

MINNEAPOLIS - HONEYWELL REGULATOR Co., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
Brown Instruments



32 connector sizes needed on this job!

One connector size is plenty with this XTP!

For Tee or Parallel Taps!

ONE O. Z. FITTING DOES THE WORK OF 32

One typical XTP connector replaces up to 32 different parallel or tee connectors because each XTP accommodates a wide range of wire sizes. All told, the XTP line of but 25 connectors will receive *over 400 wire-size combinations!*

For either tee or parallel taps, just snap special hinged clamp over main and tighten—the connector is permanently in place, positive contact assured. When you're ready to connect the tap, simply insert wire in tap end of connector. A wrench-turn or two and the job's done!

25 CONNECTOR SIZES do practically all tap jobs.
- Accommodate over 400 combinations of wire sizes
- Fit wire from #8 to 1,000,000 CM

HINGED CONSTRUCTION for quick installation.

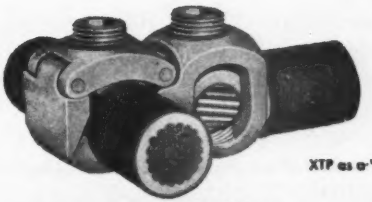
SPRING STEEL LOCKWASHERS (tin plated) maintain pressure.
- Hold resiliency—assure permanent connection

PRESSURE PLATES designed for maximum contact and grip.
- Serrated for firm grip
- Can not rotate during installation

HIGH STRENGTH, HIGH CONDUCTIVITY.
- High conductivity copper alloy for body
- Extra strength copper alloy for pressure plates and hinged parts

Get these combination fittings from your wholesaler now . . . and put an end to bulky assortments of tap connectors.

CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • SOLDERLESS CONNECTORS
GROUNDING DEVICES • POWER CONNECTORS



XTP as a "T" tap

XTP as a parallel tap

They're O. K. if They're O. Z.

661

O. Z. ELECTRICAL MANUFACTURING COMPANY

262 BOND STREET · BROOKLYN 2, N. Y.

An Important Message On CMP

It has come to our attention that some steel consumers, particularly those concerned with "B" products, have been requesting allotments from their steel suppliers or passing on to them their allotment authorizations. This is contrary to CMP regulations, and seriously delays the entire allotment procedure for you.

Therefore, in an effort to help clarify this situation, we have briefly indicated below the general procedure which should be followed in securing an allotment.

▶ We would like to emphasize that steel warehouse distributors are not involved with the handling or issuance of allotments. When placing an order with your steel supplier, simply show your allotment number and the quarter for which the allotment is valid (Example: K-2-4Q51). Orders must also be properly certified under CMP regulations.

The General Requirements For Obtaining An Allotment

CLASS "A" PRODUCERS

1. If you are a producer of a class "A" product, you will get your allotments for controlled materials from the claimant agency (governmental), prime consumer (seller to claimant agency), or secondary consumer (seller to prime consumer) to whom you sell your product. IN EACH CASE, GO DIRECTLY TO YOUR OWN CUSTOMER FOR AN ALLOTMENT.

2. Your allotment application (Form CMP-4A) must include the amounts of controlled materials needed by your sub-contractors as well as by you.

3. You need not apply for controlled materials used for class "B" products to be incorporated in your class "A" product, since producers of class "B" products will receive their allotments direct from the NPA.

CLASS "B" PRODUCERS

1. If you are a producer of a class "B" product your application for controlled materials on Form CMP-4B must be sent to the proper industry division of NPA. You cannot obtain an allotment from any other source.

2. Your application Form CMP-4B must show all the controlled materials you need, as well as controlled materials needed by your sub-contractors producing class "A" products to be incorporated in your class "B" product.

UNITED STATES STEEL SUPPLY COMPANY

Warehouses Coast to Coast

BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. · NEWARK
PITTSBURGH · PORTLAND, ORE. · ST. LOUIS · TWIN CITY (ST. PAUL) · SAN FRANCISCO · SEATTLE

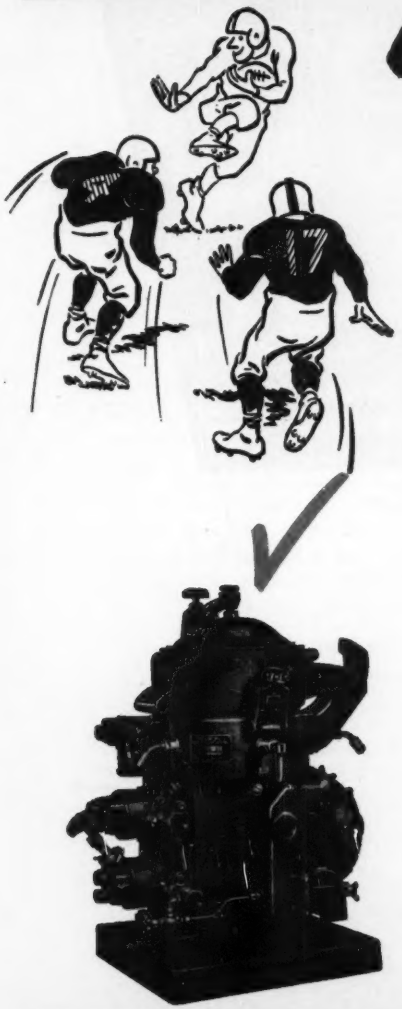
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · PHOENIX · ROCKFORD, ILL. · SALT LAKE CITY · TOLEDO · TULSA · YOUNGSTOWN

Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL

DOUBLE TROUBLE

BUT NOT YOURS!



Dirt and water will not ruin your lubricating oil if you use a De Laval centrifuge to purify the oil. For the De Laval machine will remove both the ***solid*** and the ***liquid*** impurities that so easily contaminate lubricating oil.

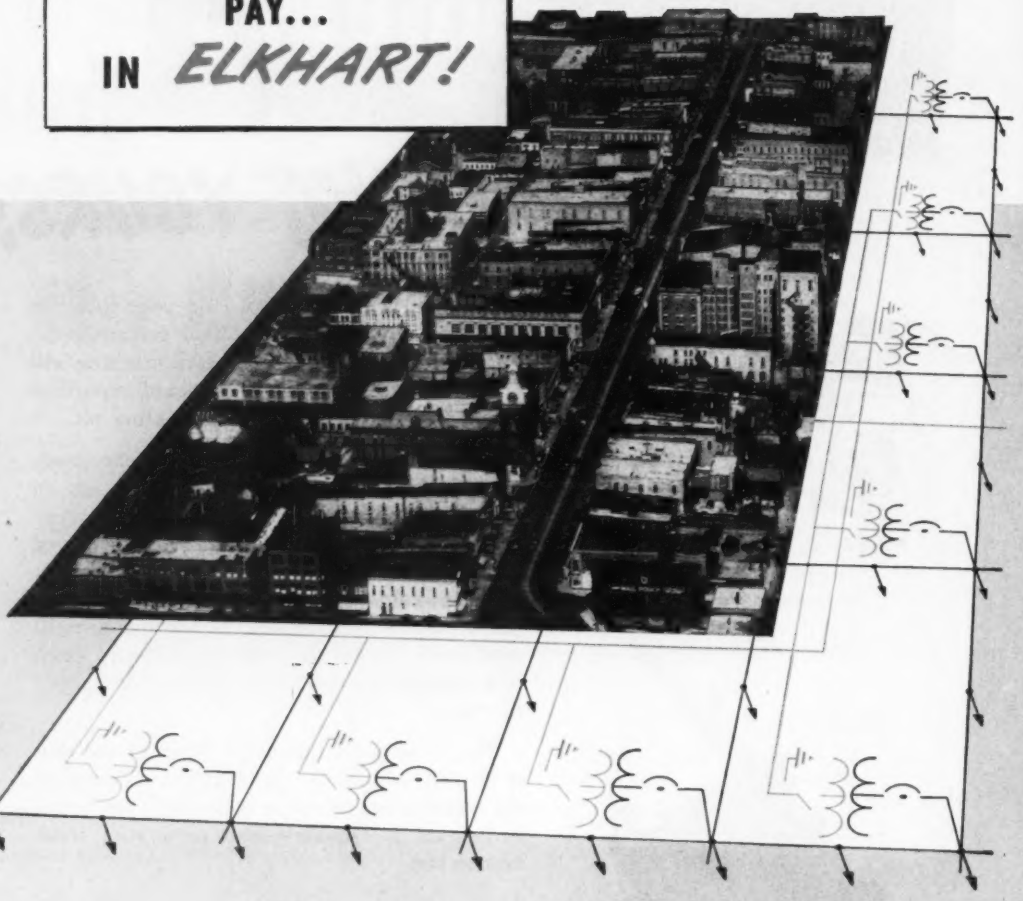
Centrifugal force, applied most effectively in the De Laval bowl, throws dirt out of the oil and stores it out of harm's way until cleaning time. The dirt that has been removed cannot re-mix with the oil and contaminate it all over again, nor can dirt store up within the purification area to lessen the ***effective*** centrifugal force. As far as water is concerned, once it is centrifuged out, it is gone — discharged to waste.

That is why De Laval Oil Purifiers are ***constant efficiency*** units—purification as sure at the end of a run as at the beginning. De Laval Protection is Double — and unvarying from first to last.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL LUBRICATING OIL PURIFIERS

NETWORK SYSTEMS PAY... IN *ELKHART!*

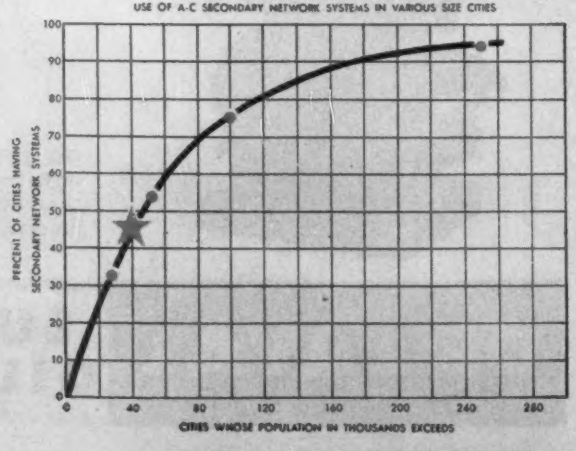


FACTS ABOUT ELKHART'S A-C SECONDARY NETWORK SYSTEM.

The secondary network system is supplied from 13 vaults having a total capacity of 3,900 kva. The area covered by Elkhart's network is almost 20 square blocks, containing 3.61 miles of conduit, 5.47 miles of primaries and 2.27 miles of secondary feeders.

•

One third of all cities in the United States with a population of 25,000 or more have network systems, while one half of all cities with a population of 50,000 or more have network systems.



17 years' uninterrupted service... no voltage-regulation problems

There's no power service problem in the business district of this bustling Indiana town of 40,000 . . . they took care of that 17 years ago. Then, Elkhart was struggling with an overloaded radial system, consisting of 3-phase primaries and both 3-phase and single-phase secondaries . . . tranformers were mounted on practically every pole. The Fire Department and fire underwriters were concerned . . . the utility was plagued with voltage-regulation problems.

OVER AND UNDER . . . In 1934 the Indiana and Michigan Electric Company met the problems of Elkhart's business district by installing an *A-C Secondary Network System*. Transformers and primaries were placed underground . . . the secondaries and services overhead. This overhead and underground combination, particularly applicable to smaller cities and towns, made possible great economy in the original installation cost.

IMPROVED SERVICE . . . The A-C Secondary Network System has resulted in a high standard of continuity of service and uniformly good voltage-regulation, not attainable through radial distribution systems. Underground placement of the primaries and transformers has greatly reduced congestion and improved appearance.

ABOUT MAINTENANCE . . . Maintenance story here is typical of all users of secondary networks . . . it's low, almost negligible. The utility reports that in 17 years of operation, there has never been a complete interruption of the system. Underground crews like the convenience of maintaining the system. They know . . . they work with the equipment.

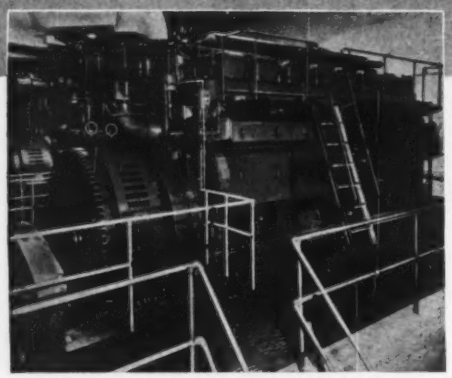
CUSTOMERS AND UTILITIES BENEFIT . . . Utility customers appreciate the high-quality service and uniformly good voltage-regulation afforded by network service. The utility benefits from reduced operating and maintenance expense and improved customer good will. Large or small, your town can have high-quality network service . . . at a cost commensurate with the benefits this service affords. Westinghouse makes this equipment and can help in your planning. Call or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-97155

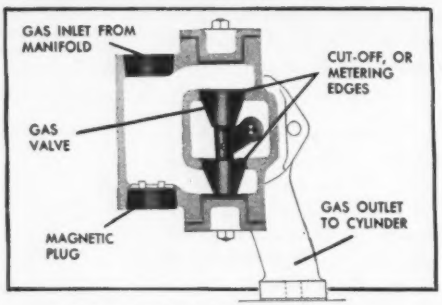
YOU CAN BE SURE.. IF IT'S
Westinghouse
NETWORK EQUIPMENT

They're Handling Expanding Power Loads The Fast, Low Cost Way:

Iowa Utility Company, Like So Many Others, Uses Worthington Dual Fuel Units For Uninterrupted Service On The Cheapest Fuel Available



A Worthington Supercharged Dual Fuel Engine in the Oskaloosa plant — part of the Iowa Power And Light Company System.



WORTHINGTON MICRO-METERING GAS VALVE
One for each cylinder

Used on Spark Ignition and Dual Fuel Engines — Governor controlled — Individually adjusted.

Assures: — Equal cylinder loading — Smooth running at all loads — Better speed regulation — Lower maintenance.

Full load operation, 24 hours a day, is routine performance for Worthington Dual Fuel Engines. They're designed and built to do just that — and they're doing it for power companies in communities all over the world.

They're saving money for their users every day, too, because of their Worthington-pioneered dual fuel feature that enables them to operate on gas or oil, or any combination of these fuels. Also, without losing load, they can instantly be changed over from one fuel to the other.

When gas is your fuel, only a very small amount of pilot oil is needed for ignition. Micro-metering valve (see drawing) on each cylinder provides equal distribution of gas for smooth, steady operation. Supercharging assures maximum economy through high thermal efficiency with either fuel.

BESIDES FUEL SAVINGS—

Lubrication and maintenance costs have been cut to a minimum through an effective system of "hot-spot" lubrication, according to users of Worthington Dual Fuel Engines. Why not get the whole story that proves *there's more worth in Worthington*? Write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

WORTHINGTON

E1-2

YOUR PARTNER IN POWER PROGRESS

WORTHINGTON-BUILT AUXILIARIES

Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,200 hp.

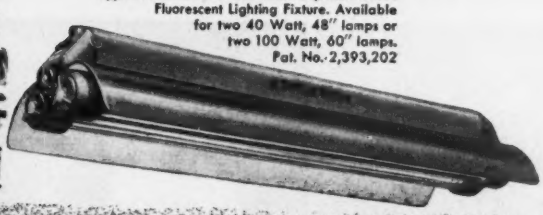
Balanced Angle Compressors

Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

Type EFU—First and still finest Explosion-Proof Fluorescent Lighting Fixture. Available for two 40 Watt, 48" lamps or two 100 Watt, 60" lamps. Pat. No. 2,393,202



Industrialite High Mounting Fixture—For railroad yards, steel mills, round houses—any industrial plant calling for a ruggedly built, high-mounted lighting fixture.

BETTER LIGHT *for* BIGGER PRODUCTION

Stocklite—Provides perfect illumination for shelves and bins in stock rooms.

RLM Standard Dome Fixture—Reflector made of rust-resisting iron and finished with three coats of baked porcelain enamel. Sectionalized construction permits easy installation, convenient servicing.

Fewer rejections . . . greater safety . . . better employee relations . . . increased efficiency to meet defense demands—these are the immediate returns on an investment in good industrial lighting.

Appleton Industrial Lighting Equipment is precision-designed to provide *good light*—the right light, without uncomfortable glare, troublesome contrast or shadow. Expert engineering, unequalled manufacturing facilities and nearly a half century of experience are combined in each Appleton fixture to provide maximum efficiency at minimum installation, service and operating expense.

Appleton Lighting Fixtures are made to suit every industrial requirement—including hazardous locations—whether indoors or out. For the finest illuminating equipment or expert assistance on any lighting problem, contact Appleton—Standard for Better Lighting.

APPLETON INDUSTRIAL LIGHTING

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1705 Wellington Avenue • Chicago 13, Illinois

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 429 Brown-Marx Bldg. MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street CINCINNATI, 626 Broadway • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9.

Resident Representatives: Binghamton, Dallas, Indianapolis, Kansas City, Orlando, Milwaukee, New Orleans, Seattle, Portland, Ore.

Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

MALLEABLE IRON CONDUIT FITTINGS

APPLETON

OUTLET BOXES AND SWITCH BOXES

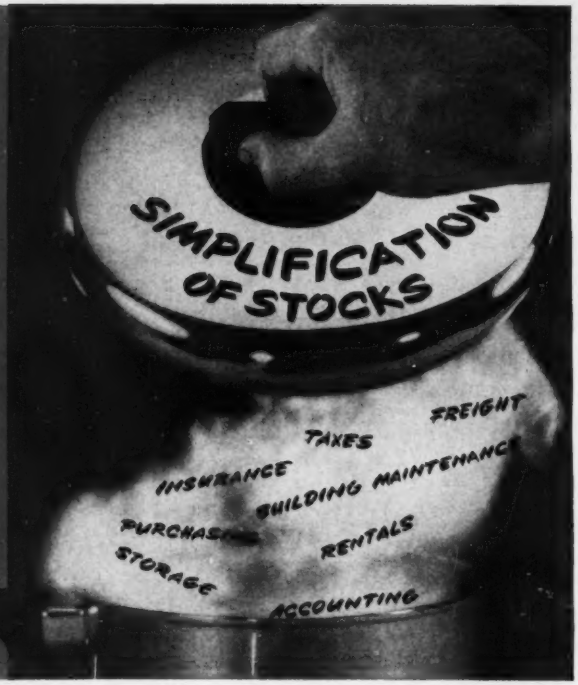
ELECTRIC

INDUSTRIAL LIGHTING EQUIPMENT

PRODUCTS

EXPLOSION-PROOF FITTINGS - FLEXIBLES

Put this lid on rising costs of inventory maintenance



If you've got an inventory of materials and supplies worth $3,000,000, you're probably paying anywhere from $150,000 to $900,000 just to maintain it. The cost of inventory maintenance ranges, as you know, from 5% to 30% of annual inventory value, depending on local conditions under which a utility operates.

Very often you can substantially reduce this cost of inventory maintenance by further standardization and simplification of stocks. Today many utilities are using this method to help offset the effect of rapidly mounting operating costs. If you're one of these, Locke can help with the job.

SIMPLIFICATION MADE EASY WITH LOCKE'S *RM HANDYLOG

It's the perfect working partner for men wanting to further standardize and simplify their stocks of Pole Line Hardware. It lists ONLY the standard items you need. By using it, you stock fewer items, all fast movers. Each is regularly in production, and carried in stock by your Locke Regional and Distributors' Warehouse. If you haven't got a copy, write for Locke's RM Handylog today. Place the items in it on your standards list. Do this and you'll be taking the industry's only practical short-cut toward further simplification of hardware stocks. Locke Department, General Electric Company, Baltimore, Md.

*RM (Repetitive Manufacture)
A program designed to help reduce the installed cost per kilowatt on line and station equipment.

The industry's ONLY guide to reduced inventory maintenance costs through simplification of Pole Line Hardware stocks.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Before you buy stop! See what Locke's Got!

82 JOB-RATED industrial lighting units

there's a DYNALITE that's *production-right* for every job...

MITCHELL DYNALITE

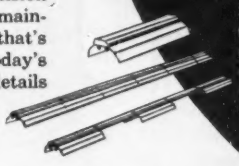
You name the job—there's a new MITCHELL Industrial Lighting unit designed to put the *right light* over *any* production operation. There's nothing like the Dynalite Line—an unprecedented range of 82 *Job-Rated* lighting units you can specify with confidence for superior light in every working area. Advanced features, precision construction for easy installation and maintenance, built-in lifetime durability—that's Dynalite—the *complete* answer to today's industrial lighting needs. Get all the details on this outstanding line now!

THE COMPLETE, UNIFORM, IN-STOCK INDUSTRIAL LIGHTING LINE

- 6 LAMP TYPES AND SIZES
- 4 LAMPHOLDER TYPES
- 3 SHIELDING TYPES
- 2 REFLECTOR TYPES

THE *RIGHT* UNIT FOR EVERY JOB

4, 5, 8 and 10 foot lengths . . . 2, 3 and 4 lamp units . . . single, tandem and combination models for standard or alternate-spaced lighting. Continuous uniform wireway channel for easy planning of any installation *light-rated for the job.*



SEND FOR IT COMPLETE ILLUSTRATED **DYNALITE CATALOG**

See how MITCHELL Dynalite custom-fits any industrial lighting job. Send today for the FREE Dynalite catalog—packed with full technical detail that makes it easy to specify *correct* industrial lighting. Write for it now.

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In Canada: Mitchell Mfg. Co., Ltd., 11-25 Davies Ave., Toronto

MITCHELL MANUFACTURING COMPANY
2525 N. Clybourn Ave., Chicago 14, Illinois

☐ Send Free descriptive catalog on MITCHELL "Dynalite" Job-Rated Industrial Lighting

Name .....

Firm Name .....

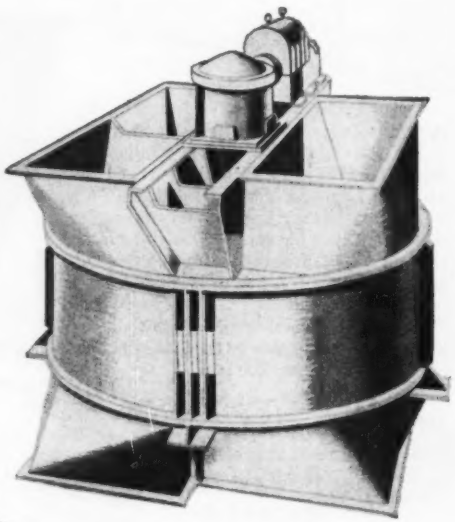
Address .....

City ..... *Zone* ... *State* .....

The Ljungstrom Air Preheater Can Help You

1. To improve combustion of low-grade fuels
2. To raise the level of heat recovery
3. To save materials in plant design

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.



If you want to improve the combustion of low-grade fuels . . . raise the level of heat recovery . . . conserve critical materials in plant design . . . you or your consultants can make profitable use of Preheater experience. Let our specialists tell you more about the Ljungstrom Air Preheater, and the outstanding job it has done for hundreds of America's leading industries and public utilities, where the need for preheated air from 300F to approximately 1200F was part of their problem. Our engineers are ready to work with you in applying the Ljungstrom to your own heat recovery problem.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

A MESSAGE TO AMERICAN INDUSTRY

"This is more than a shortage . . . this is an emergency.

Every pound of your scrap is needed, NOW !"

"THE STEEL INDUSTRY is currently operating at more than 100% of rated capacity—turning out well over 2 million tons of steel per week. This record high production—every ton of which is in urgent demand—cannot be kept up unless we get more scrap from every potential source. For without your scrap we cannot produce enough steel. Today, every ton of steel turned out requires a half a ton of scrap for its production. That's why scrap—more scrap—is so urgently needed, and needed right away.

"The fact we have to face today is that steel mills are operating on a hand-to-mouth basis as far as scrap is concerned. Some mills are working on only a two-day supply of scrap. We already have had to shut down steel-making furnaces for lack of scrap.

"That's why we are asking you to strain every effort to get more scrap out of your plants and yards and on its way to the mills . . . to search out the scrap that doesn't come to market in normal times. You'll find this "dormant" scrap in obsolete equipment, tools and machinery that you haven't used for years . . . overlooked in your storage sheds . . . or rusting away in a junk pile in some forgotten corner. It's there. Turn it in at once—*so we can turn out the steel you need.* We can't do it without your help."

B F Fairless

President, United States Steel Corporation

USS

1-1182

UNITED STATES STEEL

28 Years

EXPERIENCE BACK OF KNOX

SERVICE-QUALITY SATISFACTION

from 110 volts to 220,000 volts

ALL FROM ONE SOURCE

ASK FOR CATALOG — PROMPT DELIVERY

MANUFACTURED BY

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KNOXVILLE 1, TENNESSEE

GOULD

Plus-Performance Plan

. . . PROVES THAT

CORRECT INSTALLATION
EXTENDS BATTERY SERVICE

Right now, the problem of conserving and extending stationary battery power is urgent. Timely help is offered you through the GOULD PLUS-PERFORMANCE PLAN which can extend battery service tremendously. Here is a complete system of manuals, articles, specifications, bulletins, record cards and charts which explains and illustrates how to select, charge and handle, maintain and determine the condition of batteries used in switchgear, alarm system, emergency light and power and telephone service.

The material comprising the GOULD PLUS-PERFORMANCE PLAN is available to battery users without obligation. A request on your letterhead will bring descriptive literature by return mail.

Gould Planté—
The Aristocrat of
Stationary Batteries

An example of good installation—step racks, marking of each cell assembly and clean, well ventilated room.

LOCATION—INSTALLATION—CONNECTION

Location—Batteries need some ventilation and not too much heat. Keep away from heat-generating equipment. Battery room should be adequately lighted, but batteries should not be placed in the direct rays of the sun.

Installation—Always install batteries on racks of suitable height to permit convenient water additions and hydrometer readings. Racks should be coated with acid-resistant paint, should be level, and insulated from floor.

Connection—All contact surfaces should be clean and a thin coat of vaseline applied. Line cells up with a cord. Apply intercell connectors by starting at the center, connecting positive to negative, making sure all connections are tight. Check polarity of all cells and see that electrolyte is at proper level.

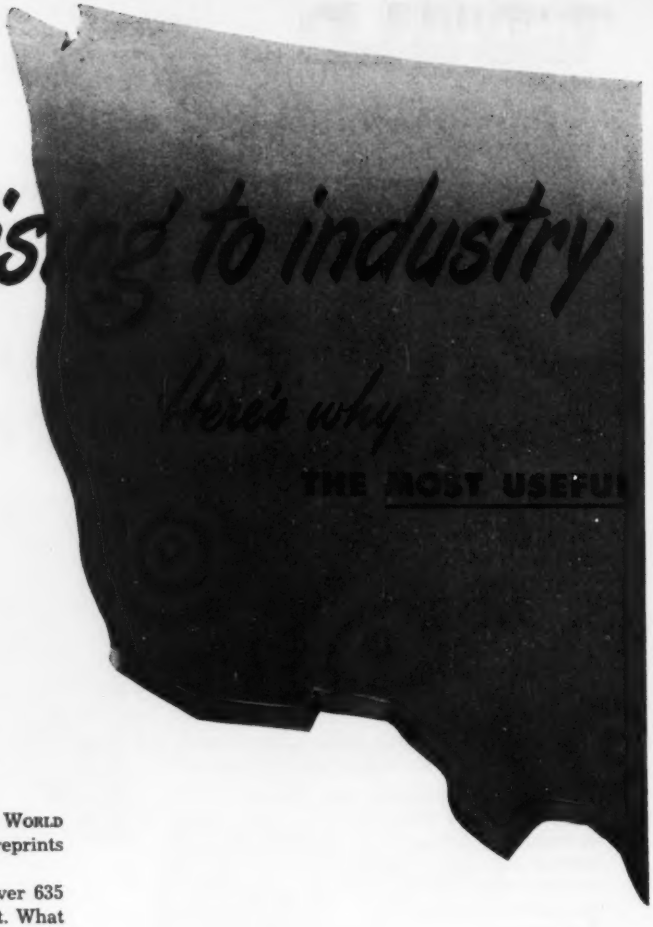
GOULD

STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries

In advertising to industry



In the last three years, ELECTRICAL WORLD has filled requests for 3½-million pages of reprints of ELECTRICAL WORLD articles.

"Laid end to end" these pages would cover 635 and ⅓ miles, not exactly an important fact. What is important, if you have something to sell to the great growth industry, is that the men who direct and operate this industry write in and pay for more than a million pages of ELECTRICAL WORLD reprints a year, with no urging on our part whatever.

In the first five months of this year we received requests for 3,191 reprints of an article which appeared in ELECTRICAL WORLD's issue of January 16, 1950—a year-and-a-half ago—and 1307 requests for reprints of an article on purchasing published August 22, 1949. We know of one reader—an important man in the industry—who has three shelves full of file volumes holding reprints of every article on lighting that has appeared in ELECTRICAL WORLD since 1903!

In the last six months of 1950, articles in all but three regular issues of ELECTRICAL WORLD were reprinted by request. And during the first five months of 1951, articles in all but one issue have been reprinted and mailed to readers sending in requests. Consistently, issue after issue, ELECTRICAL WORLD brings its readers information so useful that they find urgent need for extra copies.

We could cite a good many similar examples. These are enough to point out the intimate and highly important part ELECTRICAL WORLD plays in the working lives of the men who direct and operate the electric power industry.

If your product is displayed on these pages, and its performance facts usefully explained, it *can't help* entering into the active job-interests of these men.

This year, next year, and the year after that, the men in the electric power industry will spend more money on capital goods than any other industry in the world.

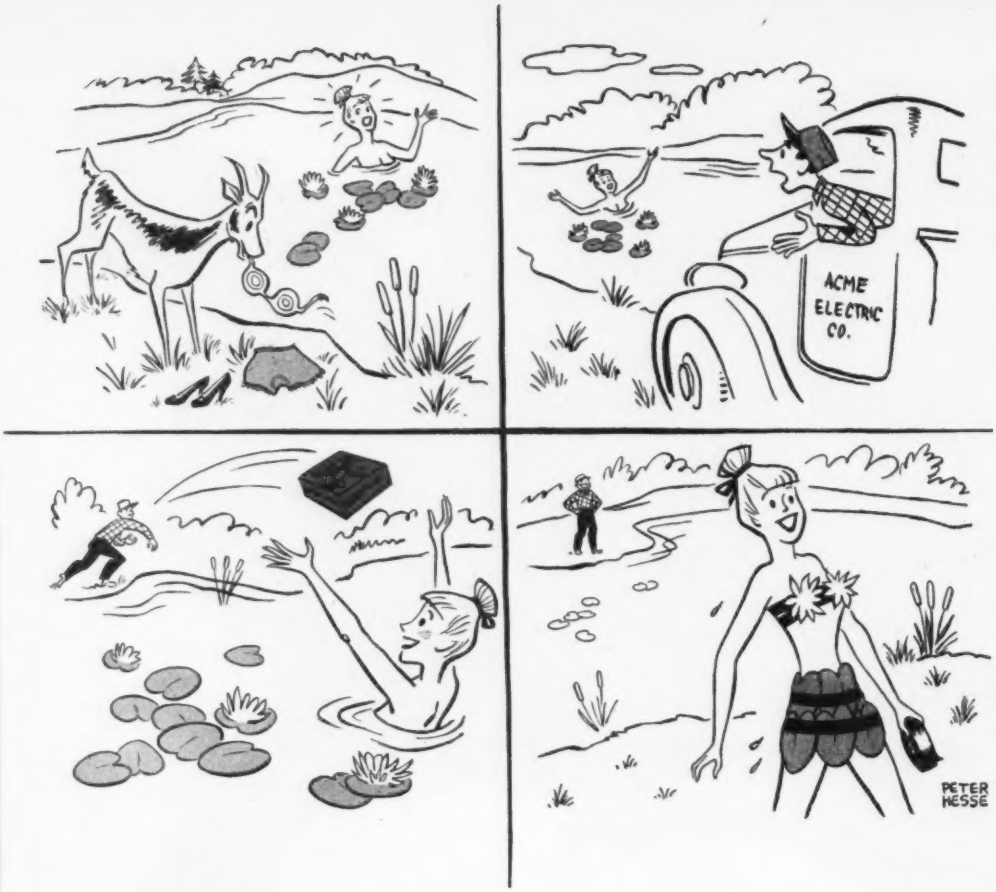
To inform them on the performance facts of your product, and to *keep* them informed, tell your story in the one magazine they turn to, far more than any other, for information to help them on the job.

GOOD ADVERTISING PAYS IN *Electrical World*

JOURNAL OF THE GREAT GROWTH INDUSTRY FOR 77 YEARS

A McGRAW-HILL MAGAZINE
McGRAW-HILL BUILDING, NEW YORK 18

ABC • ABP



YOU CAN DO A LOT WITH A LITTLE JENKINS

Damp or dry . . . over uneven surfaces, Gold Seal tapes up tight. It's always "tacky" (adhesive compound is prepared under laboratory control), has high dielectric strength (less footage is needed per job), *goes further* (there's no waste). Gold Seal makes a hit with linemen and electricians because (1) it makes a tighter, longer-lasting bond, and (2) gives you more tape value in every roll. Ask your supplier for Gold Seal Tape, made by Jenkins Bros., (Rubber Div.), 100 Park Ave., New York.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal specifications.

Gold Seal Tape

FRICTION and RUBBER TAPES

In either 10-roll cartons or single rolls. Every roll cellophane-wrapped.

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

When it comes to fluorescent lamp brands here's the brand of quality

All fluorescent lamps look alike. But all do not light alike, or last alike. Westinghouse fluorescent lamps are unsurpassed in giving long-life, top-quality performance. This long-time service means savings in lamp replacements and lamp replacement time. So, whether you're lighting a roundhouse or ranch house, specify Westinghouse; there's no better value for your money.

YOU CAN BE SURE...IF IT'S Westinghouse

Ann
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Seven Up
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Send me more information on how I can save with Westinghouse fluorescent lamps.

NAME..... TITLE.....
COMPANY.....
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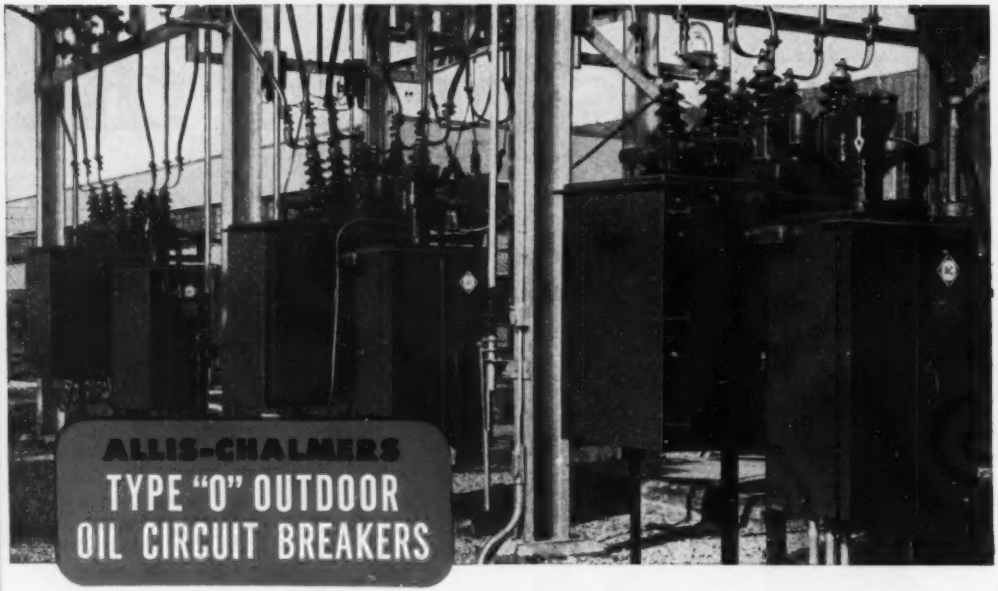
Dependable

ELECTRICAL PROTECTION

FOR DISTRIBUTION SYSTEMS



Packaged complete for improved automatic reclosing service

ALL YOU NEED to order your type "O" breaker is one set of specifications. It's simple and convenient. This standard 3-pole breaker comes to you mounted on a strong lightweight framework with operating mechanism and automatic reclosing equipment each in its own weatherproof housing. The type "O" breaker is factory assembled, wired and tested in accordance with ASA standards . . . ready to install and operate.

SECURE THESE PROVEN ADVANTAGES

1. **Positive, high speed breaker action with mechanically and electrically trip-free solenoid operating mechanism, ac or dc operation as specified.**
2. **Efficient circuit interruption with high rate of dielectric recovery for low contact and oil deterioration.**
3. **Automatic reclosing duty for unattended stations with standard protective and reclosing relay equipment included.**

Feature for feature you cannot buy better breakers in this class. Over 50 years of Allis-Chalmers progress in power circuit breakers is built into them. You can install them with complete confidence. For more information call your local A-C sales office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for bulletins 71B6165A (OX-18) or 71B6093C (OZ-110, OZ-210).

A-3440

Type	Rated KV	Rated Amps. (60 cycle)	Interrupting Capacity KVA
OX-18	7.2	600	50,000
OZ-110	14.4	600	100,000
OZ-210	14.4	600	250,000
OZ-210	14.4	1200	250,000
OZ-210	23	600	250,000

ALLIS-CHALMERS

The Wakefield Star and Commodore both have translucent Plaskon reflectors which completely shield the lamps and, when the lamps are lit, have about the same brightness as the ceiling above. This is a basic requirement of supplementary lighting systems for co-ordinated classrooms.

To Light a Co-ordinated Classroom

you need a luminous indirect fixture like the

Wakefield { STAR *(fluorescent)* / COMMODORE *(incandescent)*

1. Only a luminous indirect fixture like the Wakefield Star or Commodore will provide smoothly distributed, well balanced light, free from glare and sharp brightness contrasts.

2. Only a luminous indirect fixture like the Wakefield Star or Commodore will create three-dimensional seeing conditions by making the ceiling the primary light source, with the fixture itself and the side walls becoming a secondary source.

3. Only a luminous indirect fixture like the Wakefield Star, which has a minimum of opaque cross-section and a maximum of translucency, will permit fullest transmission of upward beams of daylight from directional glass block.

Our new 20-page book, "Supplementary Lighting for the Co-ordinated Classroom", deals simply but comprehensively with modern classroom lighting. For your copy, write to The F. W. Wakefield Brass Company, Vermilion, Ohio.

Wakefield Over-ALL Lighting

BASIC FOR CO-ORDINATED CLASSROOMS

Rely on Quality

INDUSTRIAL

PYLE-NATIONAL LIGHTING FIXTURES

for longer service life, added Safety and Efficiency

EXPLOSION-PROOF

Pyle-National LE Series (Class 1, Groups C and D)

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.

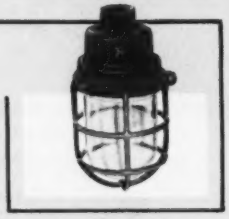
DUST-TIGHT

Pyle-National DE Series (Class II, Group E, F, G and Class III)

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

VAPOR-TIGHT



Pyle-National BO Series

For use in any outdoor or indoor location subjected to heavy concentrations of non-flammable vapors, gases, dusts, or moisture.

Heavy duty construction and especially efficient sealing features insures an exceptionally long service life. Full line for 10 to 200 watt lamps.

VAPOR-TIGHT SIGNAL OR PILOT LIGHTS

Midget Fixtures for 10 watt Lamps.

ENCLOSED FLOODLIGHTS

Sealed against moisture and dirt, constructed throughout of cast aluminum and other rugged, corrosion-proof materials, Pyle-National floodlights retain their original high-efficiency output throughout an exceptionally long service life, with negligible maintenance and replacement expense.

WEATHER-PROOF RAIN-TIGHT

SINCE 1897

THE PYLE-NATIONAL COMPANY

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Towers

BY AMERICAN BRIDGE

● The fabrication and erection of steel towers is an important part of our business.

You'll see American Bridge Company towers dotting the landscape around the world . . . and especially here in our own country, where power and communication are the life blood of practically all activity. For these are the towering steel signposts of progress!

If you need transmission towers, radio or television towers, mooring masts, tramway towers—even wind turbine towers, you'll find it to your advantage to submit your requirements to American Bridge. Our more than a half century of experience in designing, fabricating and erecting towers of all types and for all purposes can save you both time and money.

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERICAN BRIDGE

UNITED STATES STEEL

WHEREVER YOU USE WOOD..

IN THE DESERT, crossties broom, shatter and split from extreme dryness and heat. Solutions made with BARRETT* Coal-Tar Creosote retard this, and also reduce mechanical wear of crossties through their lubricating action on the wood fibers. In poles, heavy treatment with BARRETT Coal-Tar Creosote substantially reduces checking and splitting.

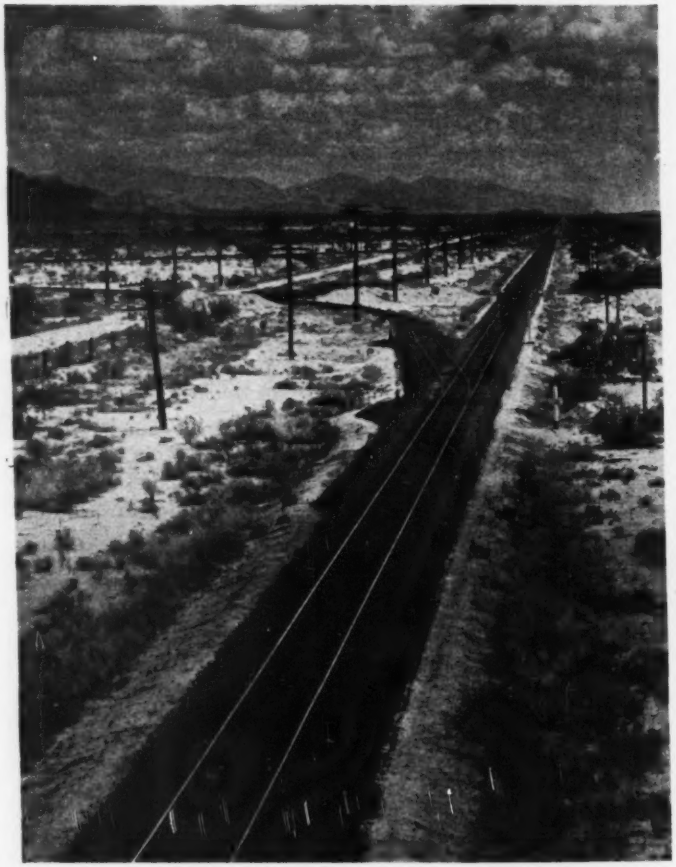
IN THE NORTH, poles must resist the tremendous weight of frequent sleet storms. Avoid preservatives which *weaken* the wood. BARRETT Coal-Tar Creosote allows poles to retain their maximum strength, and helps to keep the poles at their best and hold the lines aloft.

IN THE SOUTH, prolonged high temperatures cause light-bodied preservatives to leach and evaporate from the wood, thus exposing the wood to termite attack and decay. BARRETT Coal-Tar Creosote, heavier bodied and of lower volatility, prevents this condition. It stays in the wood longer under all conditions—doesn't "run out" on the job.

IN THE SWAMPS, forces of decay are almost at their maximum of destructive power. High moisture content and infection from other decaying wood and debris are ever-present menaces. Poles properly treated with BARRETT Coal-Tar Creosote have survived under swamp conditions for years.

IN FRESH WATER, many preservatives leach out of wood. BARRETT Coal-Tar Creosote resists this leaching action. Being only negligibly soluble in water, it is the preferred preservative for use on submerged wood structures, or those exposed to the powerful action of rapidly flowing water.

IN SALT WATER, marine wood-borers give a preservative its severest test. Of hundreds of preservatives that have been tried through the years, *Coal-Tar* Creosote is the only one that has proved consistently effective against teredos, limnoria and other salt-water enemies of wood.



THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Use Barrett*

*Reg. U. S. Pat. Off.

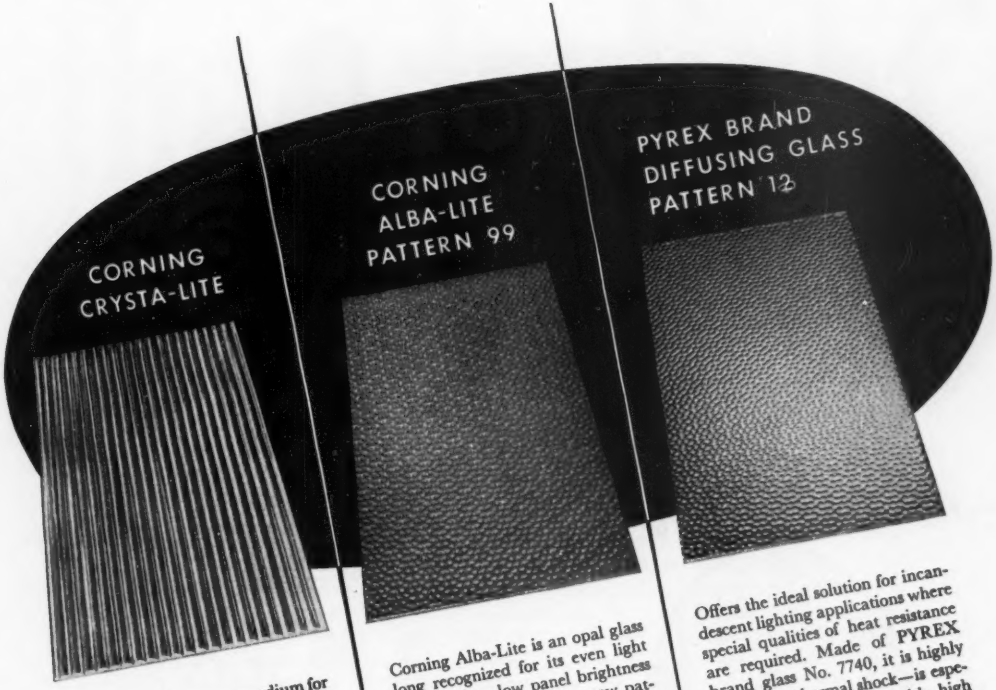
Only coal-tar creosote wood preservative has been used long enough and widely enough to have proved its effectiveness under all conditions.

COAL TAR CREOSOTE

ANNOUNCING

Three New Additions To Corning Engineered Lightingware

As a result of a continuing effort to give you new and better lightingware, Corning research has developed three new additions to the Corning line. Like all Corning Engineered Lightingware, they provide maximum efficiency, effective light control, and design flexibility. The coupon below will bring you complete information on these important new products. Mail it today.



Here is an entirely new medium for prismatic control of fluorescent light. Utilizing linear prisms, it controls the distribution of light by bending high angle rays downward into zones where they are useful for illumination—gives you higher intensities with fewer fixtures and accurate brightness control. Efficiency is high. Made of water-white crystal, Corning Crysta-Lite is light in weight and non-color selective. Available in widths up to 24", lengths up to 100".

Corning Alba-Lite is an opal glass long recognized for its even light transmission, low panel brightness and high efficiency. The new pattern 99 is uniformly pebbled on one side to give greater "hiding power" —outline of light source is completely diffused. It makes for pleasing fixture appearance, is easy to clean. Available in (⅛" thick), widths up to 24" and lengths up to 100", Alba-Lite Pattern 99 is easily cut to special shapes or made into bends as required.

Offers the ideal solution for incandescent lighting applications where special qualities of heat resistance are required. Made of PYREX brand glass No. 7740, it is highly resistant to thermal shock—is especially suitable for use with high wattage lamps or in outdoor installations. The uniformly pebbled surface provides excellent diffusion and even illumination. Available in widths up to 24" and lengths up to 60" (⅛" thick), it can be cut to any required shape.

CORNING GLASS WORKS
CORNING, NEW YORK
1851 *Corning means research in Glass* 1951

CORNING GLASS WORKS, Dept. EW-8, Corning, N. Y

Please send information on:

☐ Corning Crysta-Lite ☐ Alba-Lite Pattern 99
☐ PYREX brand Diffusing Glass Pattern 12

Name_____ Title_____

Firm_____

Address_____

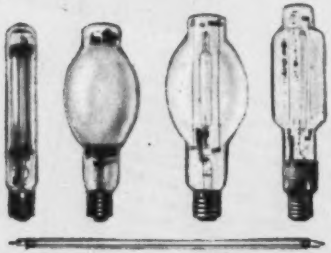
City_____ Zone____ State_____

EMPLOYEES SAY,

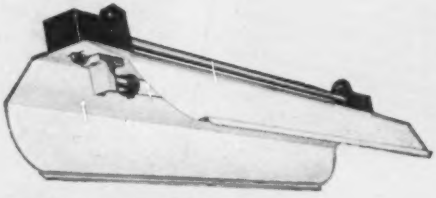
1000-watt mercury high-bay luminaire 25 ft. and over

400-watt millite luminaire
16 ft. and over

400-watt mercury luminaire
16 ft. and over



Complete range of lamps, including the new color-corrected J-H1 400-watt lamp.



3000-watt mercury luminaire
40 ft. and over

Complete range of ballasts for high or low-voltage distribution systems.

"Better than daylight"

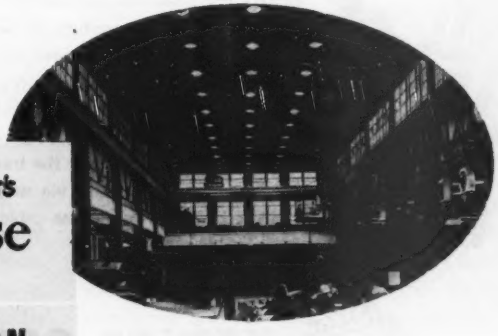
with Westinghouse MERCURY lighting

"We get over 50 footcandles evenly distributed in this work area—and have completely eliminated the need for auxiliary lighting," says Chief Electrician of an Ohio plant about their new main high-bay-assembly area.

What's more, he further states that the employees report, "It's even better than working in daylight . . . there are no shadows or glare." A Westinghouse combination mercury-incandescent system takes credit for these results.

He concluded, "We have always believed that high-quality illumination pays for itself in more and better work, fewer errors . . . and this installation, made according to a plan, proves that it does just that." Only Westinghouse can offer you the complete mercury system—luminaires, lamps, and ballasts.

It will be well *worth your while* to investigate Westinghouse, where you can review all sources and all types before selecting one system. Get B-4727, "Lighting at Work" in every industrial area. Call your nearest Westinghouse Office or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-04298



YOU CAN BE SURE...IF IT'S
Westinghouse

LIGHTING DIVISION
Edgewater Park, Cleveland

The miracles of modern electric illumination were all foreshadowed by the glow of Edison's first lamp—implicit in the great IDEA. Also implied in this, as in all epoch-making inventions, were the corollary imagination and effort of thousands of unpublicized successors—pioneers of America's vital electric illuminating industry.

KERITE insulation was well established before the turn of the century. Already famous in telegraphic and signal applications, Kerite quickly won recognition for safety, dependability, and ultimate economy in the infant lighting and power industry . . . for the transmission of electric power via aerial, underground, and submarine cable.

By conscientious workmanship, careful handling, and a continuing search for new and better applications of its unique formula, The Kerite Company has been able to anticipate the power industry's needs. It will continue to apply itself to the technical world of "ideas" in which now, as in Edison's day, the future of America's power still lives.

KERITE CABLE

Kerite Insulation—Your Cable's Best Life Insurance

Editorials

Celebration and Dedication

The "Farm Electrification Week" of Aug. 26 should be a time of dedication as well as celebration. It is fitting that the accomplishment of the various segments of the electrical industry in making service available to practically all of rural America should be celebrated. More important, though, is recognition that what has been done is only the start of a much bigger job. As George M. Gadsby, president of Edison Electric Institute stated, "We are celebrating not the final crossing of the goal, but the end of the first half."

Now that 95% of the farmers have electricity, what are they going to do with it? That is the question. Some few farmers are moving faster than the rest in putting electricity to work. But the general picture is one of a great new force that has been put into the farmer's hands and one which he does not fully know how to use.

To teach the farmer how to make profitable use of electricity is the dedicated task of the electrical industry. To this task the industry must devote invention, research, study, experiment, and, most of all, selling. Over the years, the electrification of industry has had to be sold, and still has. So, too, with electricity in the home. It was, and is, not enough that electric service be available, that machines, devices, and appliances be invented, developed, and manufactured. They and their usefulness have had, and still have, to be sold.

Much progress has already been made in devising and developing the means by which electricity can be put to work in farm operations. Much more remains to be done in this direction. But principally the job of the electrical industry is to sell what now is available in service and equipment. As more electricity and more electrical goods are put to profitable use on the farmstead, more ways will be found to increase their usefulness and their number.

No one knows how much electricity and electrically operated equipment are used on American farms today. No one has any competent estimate of the future of farm electrification. Such knowledge of the present and potential market is necessary if adequate provisions for producing the goods and supplying the energy for it are to be made. Such knowledge is necessary for the building up of selling strength without which the provision of goods and service is useless.

Jointly with the National Electrical Manufacturers Association, "Electrical World" is now making a survey of farm electrification—present and future. The survey covers about 100 manufacturers of electrically operated farm equipment of all kinds. Assuming the cooperation of these manufacturers in replying to the questions asked them, the results of the survey will show how much of this equipment is now in use and how big the future market is. The results will disclose the quantities of electrical components incorporated in this equipment and how much electricity is now and will be needed for its operation. It is expected that the information and data derived from the survey will increase greatly the present small knowledge of farm electrification and its potential.

This increased knowledge should facilitate the work to which the electrical industry must now be dedicated, the work of teaching farmers how to make most profitable use of the great new force that has been put into their hands. And teaching is selling in the best sense of the word.

Are You A Capitalist?

In the June 4, 1951, issue of "Electrical World" we carried an editorial entitled "A New Word for Capitalism." We suggested that this word referring to the American economic system had been so misused by the propagandists that a change might be desirable.

Our readers came back reluctantly with suggested changes. These new name proposals included American Enterprise System, Americanism, Profit System, Citizen Ownership, and American Capitalism. It appears that none of these is strikingly different from Capitalism and that our readers would willingly agree that Capitalism just about fits the needs for a word for the American economic system.

However, regardless of the word, the important problem is to be sure that everyone is a capitalist in his own right. Only by this means can we win 100% support for the system.

The Kansas-Nebraska Natural Gas Co had this to say to employees in a recent edition of "Flame," its house organ. "You are a capitalist! You may not realize it, but you are! A considerable number of Kansas-Nebraska employees are capitalists in their own name because they own stock in the company. But even though you own no stocks or bonds, you are a capitalist if you own life insurance or have money in a saving account."

Perhaps this conforms to the definition of a capitalist who is defined as one who has capital for investment or invested. But the average American thinks that capitalism refers to ownership not to investment. It will be much easier to convince a man that he is a capitalist if he owns or is given an opportunity to own common stock. He is then invited to stockholders meetings and is given a vote in corporate affairs.

Plans for providing opportunities and incentives for employees to purchase common stock provide the best means of making capitalists out of everyone.

Today's Industrial Job

Today the nation's industrial plants are being expanded and increased under an unparalleled program. Big as it is, this program will not be sufficient to accomplish the two big tasks facing industry—the production of sufficient military goods and of civilian goods in the ever-increasing volume now demanded by the people.

This requires increased productivity, rise in output per man-hour per dollar of investment and of operating cost—for both old and new plants. Engineers and lighting manufacturers agree that improved lighting is a "must" if this increase in productivity is to be fully realized. Fortunately, many plant engineers are becoming aware that good-seeing conditions in their factories not only speed up production but also improve the efficiency of the worker, reduce accidents, improve quality, and make a more contented worker.

This is especially true of the "older" worker whose numbers are rapidly increasing. Modern lighting will increase their output. It will enable them to produce more with less fatigue than in producing less under poor lighting. It will do the same for younger workers.

It is estimated that only around 15% of present-day industrial lighting is up to modern standards. Although lighting is as much a production tool as the most complicated machine, it does not get the attention it deserves and needs if industry is to reach its goals.

In relation to its value, lighting has the smallest cost of any production component. The investment cost of industrial lighting is so small that it hardly affects the fixed charges against production. Any increase in output resulting from improved lighting is bound to pay the cost of that improvement many times over. The operating cost of lighting is also negligible in relation to labor and material costs. In fact, by comparison, lighting costs are now lower than they ever have been.

In general, store and office lighting is today far ahead of that in industrial plants. This is because more attention is given to the factors of good seeing in stores and offices. But the seeing tasks in the factory may often be more difficult—such as with poor contrasts, reflections on polished surfaces, work in motion, noisy surroundings, and stand-up posture. The investment per worker and his wage rate is generally higher in the factory than in the office. It seems reasonable therefore that the quantity and quality of lighting in the plant should not be below that which is well accepted for the office or drafting room.

American industry's expanding plant program is not enough without a much more rapid increase in unit productivity. Modern lighting can be a major contributor to productivity, and it is now far from modern. Better industrial lighting is a "must." That is why this issue of "Electrical World" features this subject.

Harry Writes Another Letter

There may be some doubt as to the place Harry S. Truman will occupy in history. But as a writer of sensational letters the stubborn man from Missouri is pen and paper ahead of any previous occupant of the White House. Nor is it likely that the future will bring him a serious rival.

Harry is a genius when it comes to writing letters that make people's blood boil. One of his latest has the private power companies doing the boiling.

Writing to James G. Patton, president of the National Farmers Union, Harry referred to the coming observance of Farm Electrification Week (Aug. 26-Sept. 1) as a "publicity stunt." He further belittled the part the companies have played and are playing in bringing electricity to rural areas.

The sad thing is that the President of the United States should write such a letter. If he had wanted to, he could easily have secured the facts and statistics showing the contributions made by both the investor-owned companies and the cooperatives.

The Electrical Week

INDUSTRY MOBILIZATION—(Pages 104 and 105) A severe slash in the request for copper products threatens to delay the power expansion program in the fourth quarter . . . Depa is using reports from utilities to push for more orderly delivery of materials . . . NPA is forming compliance commissions to hear charges on violations of NPA orders . . . NPA's two electrical industry divisions have moved to another part of the GAO Building . . . Industry M Orders are listed on p 104 . . . The steps electric utilities must take to obtain CMP materials are listed on p 105 . . . Utilities now have 30 instead of 15 days to place their orders with suppliers for allotments received on form DEPA-7 . . . DPA is getting ready to announce materials allotments for the first three quarters of 1952 . . . Pressure tubing for power plant boilers is getting scarcer . . . NPA has announced more personnel changes in its Engine and Turbine Division . . . And Central Vermont Public Service Corp has received a certificate of necessity.

WASHINGTON—NLRB refused to upset a bargaining agreement between Montana Dakota Utilities Co and IBEW (p 111) . . . REA report for fiscal '51 reveals co-ops used 25% more power than in fiscal 1950 (p 111) . . . FPC reports June capacity changes (p 111).

ELSEWHERE—Pepco tax accountant answers the question, "Is Quick Amortization Good or Bad?" (p 106) . . . Philadelphia Electric Co with many goals is likely to reach all of them (p 108) . . . Just how many farms are electrified? EEI provides the answer (p 110) . . . Output of electrical appliances has been lagging but blame lack of buyers (p 110).

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An efficiency of over 37% was chalked up for July at Schiller Station, Public Service of New Hampshire's 40,000-kw mercury-steam plant. Average overall heat rate per net kwhr was 9,168 Btu; average load during the month was 46,622 kw, with a maximum of 48,500 kw. On a recent 24-hr test run at design rating, a fuel rate of 9,133.7 Btu was achieved.

The industry's construction program is likely to be 2 million to 4 million kw (capability) behind by end of 1952, EEI reports. Delay will be in thermal installations. Reason: Failure of defense agencies to allocate needed materials. Manufacturers can meet schedules if they get them. In second quarter orders came in faster than shipments went out. Production must be high through 1953 to meet U. S. power needs.

Joppa Plant of Electric Energy, Inc, will be a semi-outdoor installation. To cut construction time and costs still further the four boiler-turbine units are being built from the same set of plans.

"No immediate danger," says Colorado State Engineer M. C. Hinderlider after investigation spurred by residents fearing leaking dike at Granby Dam and reservoir might flood valley from Granby to Kremling. Dam is key in $150-million Colorado-Big Thompson project.

Howard L. Aller asks Securities and Exchange Commission approval to remain as board member and president of American Power & Light Co.

Latest from Washington—Development of hydro power in Spain will get a $2.4-million boost from $5.6-million loan made by Export-Import Bank . . . New form DEPA-8 asks for past use (second quarter 1951) and future need (first quarter 1952) of controlled materials for minor requirements . . . Charge it up to political jealousy, but a Senate Appropriations Committeeman strongly objects to renaming Buggs Island Dam to honor a House member . . . President asks Senate for $21.8-million fund for flood control in Midwest, asks overturn of House action which cut regular flood control appropriations by 20%.

Blyth & Co group sells quickly secondary offering of 100,000 common shares of North American Co at $18.375 per share.

The industry's coordinating committee will meet Aug. 14 at EEI headquarters in New York. NAEC, PIP, and ECAP representatives will join those of EEI in a discussion of mutual problems.

Testifying before the Bureau of Smoke Control on smoke nuisance in New York City, Consolidated Edison Co's Mechanical Engineer G. R. Milne says, company uses 70% of all bituminous coal used in city, 50% of all coal (anthracite and bituminous), and 30% of all fuel (coal, oil, and gas). Company has spent $16 million since 1937 and plans to spend another $8 million before completion of present plans.

Northwest Electric Light and Power Association elects A. S. Cummins (California-Oregon Power Co president) president succeeding Thomas W. Delzell (Portland General Electric Co chairman) . . . National District Heating Association names Alfred T. Veness, Rochester Gas & Electric Corp., president.

Cut in Request for Copper Products Threatens to Delay Power Program

A severe slash in the request for copper foundry products threatens to be the main bottleneck in the electric power expansion program during the fourth quarter.

Electric Equipment Division of the National Production Authority requested nearly 17 million lb of these products—got about 6 million lb. It requested 5,613,000 lb of stainless steel—got about half.

Division officials, disturbed by these slashes, last week were preparing to go to Defense Mobilizer Charles E. Wilson, if necessary, to get additional allotments.

NPA's Engine and Turbine Division, which fared better on fourth quarter allotments, believes it will be able to provide sufficient materials to keep in step with the cutback power expansion program. However, it will not be able to make up for equipment thrown off schedule in the second and third quarters.

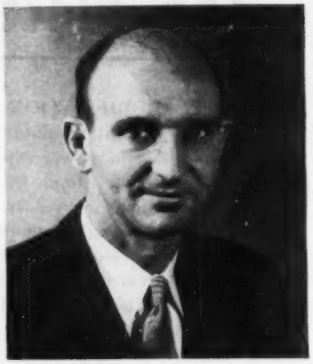
While both these divisions received increases in allotments over third quarter quotas, they were still well under requirements.

The fourth quarter materials picture has led many planners in the two divisions to predict that Defense Electric Power Administration will soon be called on to decide which power plants can be finished on schedule, which will have to wait.

A comparison of fourth quarter requests and allotments for the Electric Equipment Division shaped up like this:

Carbon steel—asked 603,000 tons, allotted 455,000 tons; alloy steel—162,000 tons and 115,000 tons; brass mill products—90 million lb and 69 million lb; wire mill products—111 million lb and 73 million lb; aluminum—38 million lb and 27 million lb.

ETD requests and allotments were carbon steel—579,000 tons and 400,000 tons; alloy steel—67,000 tons and 56,000 tons; stainless steel—6,000 tons and 5,600 tons; copper—18 million lb and 15 million lb; aluminum—2,698,000 lb and 2,600,000 lb.



B. B. Parker, Duke Power Co, is chief of Depa's Minor Requirements Branch

Industry Reports to Depa on Priority-Rated Orders

Defense Electric Power Administration today (Aug. 13) begins tallying replies to its industry letter asking for information on how priority-rated orders are faring.

In an effort to document its case for more orderly delivery of materials to electric utilities, Depa has asked for specific examples of delay in filling authorized controlled material orders already placed.

Depa says it has already received a number of reports from utilities that mills are not filling orders on schedule, even after these orders have been accepted by the fabricators or suppliers. In some cases, the fabricators and suppliers could not even place the orders with the mills.

Information was asked from utilities which have had difficulty in placing or receiving authorized controlled materials involving more than ten tons of steel, or 1,000 lb of aluminum, copper, or copper alloys.

Specific information asked in connection with delay or non-acceptance of priority-rated orders, either DO or CMP, included:

1. Serial number and title of project or identity of "minor requirements" undertaking.
2. Controlled material description, amount, and quarter involved.
3. Brief description of experience with original and alternative sources of supply contacted, including identity of supplier, fabricator, or mill.

No reports were asked in instances where delays or non-acceptance of second-quarter orders have been remedied in the third quarter.

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To Hear NPA Violations

National Production Authority will ask active and retired judges, law school deans, law professors, and practicing attorneys to sit as compliance commissioners to hear charges of violations of NPA orders. The system will be patterned after that used by the War Production Board in World War II.

2 NPA Divisions Given New Offices in GAO Bldg

The two National Production Authority divisions dealing with generating and other electrical equipment have moved from the third to the second floor of the new General Accounting office building in Washington.

New room number for Charles F. Kells, director of the Engine and Turbine Division, is 2-0-14. Several branches of this division are in Room 2-Q-15, and the Program Statistics Branch is in Room 2-R-12.

Bonnell W. Clark, director of the Electric Equipment Division, is now in 2-N-14. Branches of this division are located generally in the north central section of the second floor of this building.

The telephone number (STerling 5200) and extensions remain the same except for E&T's labor advisor, W. A. Calvin, now 4289: and E. M. Wilcox, E&T's Condenser Branch, now 3946.

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Industry M Orders

The following M Order amendment of interest to the electrical industry has been issued by the National Production Authority. A copy may be secured from the National Production Authority, Washington 25, D. C., or any regional office of the Department of Commerce:

Amendment to M-1 establishes increased percentages of **iron** and **steel** products to be set aside by mills as a reserve to fill rated orders.

Utilities Granted Extra Time to Place Allotments

Additional time is being given utilities in which to place their allotments, received on DEPA-7 Forms, with suppliers.

Beginning this month, utilities will have 30 instead of 15 days after receiving the allotment authorization to either place it with a supplier or return it to the Defense Electric Power Administration.

Some difficulty has arisen in placing orders for steel shapes, under this procedure, because specific designs had not been completed.

In such cases, Depa suggests that utilities place orders with the steel supplier for the estimated tonnage, notifying him that specifications will follow. Suppliers have agreed to accept orders in this manner. Usual procedures should be followed, including use of the allotment symbol H-3.

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1952 Materials Quotas to Be Announced by DPA

In order to give manufacturers producing long lead-time equipment a basis for next year's budgeting, Defense Production Administration is preparing to announce advance materials allotments for the first three quarters of next year.

These allotments, made to all claimant agencies, would be based on this year's fourth quarter quotas. It was tentatively agreed they would run about 75% for the first quarter of next year, 60% for the second, and 50% for the third.

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Gets Amortization Permit

The Defense Production Authority has granted a certificate of necessity for accelerated tax amortization to Central Vermont Public Service Corp. The certificate permits the utility to amortize 25% of $1,987,610 in five years.

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Boiler Tubes Scarcer

Pressure tubing for power plant boilers is becoming scarcer. NPA is being urged to subject it to stricter allocation—putting it in the same class with steel plates for boilers.

How Electric Utilities Can Obtain CMP Materials

For Major Plant Additions

Step 1—File the following forms with Depa: DPA-2, giving general description of project and list of materials needed; DPA-3, giving aluminum and copper requirements; DEPA-3S, giving iron and steel requirements.

Step 2—If project is approved, Depa will issue an authorization to go ahead with construction and will send an allotment of materials on form DEPA-7.

Step 3—To obtain controlled materials for use on the project, the utility is permitted to use the allotment symbol "H-3" along with the period designation (3Q or 4Q). It must be kept in mind that this is charged up against utility's total allotment of materials from Depa.

Step 4—To obtain "A" products such as steel towers and some custom-built items, the utility uses a "DO-H-3" rating on its purchase order. It also attaches a separate form making an allotment of controlled materials needed in fabricating the "A" items. This allotment is charged against the utility's original allotment.

Step 5—To obtain "B" products, which include shelf items such as pole-line hardware as well as heavy electric equipment, utilities are to use "DO-H-4" rating on purchase order. No controlled material allotment is needed for these items since NPA allocates material of this type directly to the manufacturer.

Step 6—To obtain materials such as wood poles, which are not controlled materials or "A" or "B" products, utilities are authorized to use a "DO-H-3" rating on their purchase orders.

For Minor Requirements Including Maintenance and Operation

Step 1—Depa has authorized material quotas for these requirements based on 1950 use by each utility. No specific authorization needed, but orders of controlled materials must be within limits set by Depa.

Step 2—To obtain controlled materials, utilities have been authorized to use the allotment symbol "H-4" along with the period designation (3Q or 4Q).

Step 3—To obtain "A" or "B" products for these purposes, the utility is authorized to use a "DO-H-4" rating on purchase order.

Step 4—To obtain materials such as wood poles, which are not controlled materials or "A" or "B" products, utilities are authorized to use a "DO-H-4" rating on their purchase order.

Cooperatives apply directly to the Rural Electrification Administration, Washington, for all materials—both for major and minor requirements.

Personnel Changes Made in NPA's E&T Division

A. B. Leonard, chief of the Coordination Section of National Production Authority's Engine and Turbine Division, leaves Washington Aug. 17 to return to his engineering concern in Los Angeles. Beginning Sept. 1, he will act as part-time West Coast consultant for the Defense Electric Power Administration, carrying out assignments with regard to construction and overall status of steam and hydro plants in 11 western states. His successor at NPA has not yet been chosen.

Other changes in the Engine and Turbine Division include:

R. Preston Davis, assistant chief of the Boiler Section, will leave about Aug. 30 to return to his post with the Wicks Boiler Co, Saginaw, Mich.

J. Wylly Keck, Jr, of the Condenser Section, left recently to return to his position with the Foster-Wheeler Corp.

Tom E. Owen is head of the newly created Fabricated Pipe Section. He is on leave from the Southwest Fabricating & Welding Co, Houston.

No successor has yet been chosen for Division Director Charles F. Kells, who is slated to return to private business in mid-September. He was the division's first director.

Is Quick Amortization Good or Bad?

Pepco Accountant Explains Advantages and Disadvantages of Tax Write-Off, Discusses Effect of Plan on Future Company Earnings

W. H. HARRISON, Jr
Tax Accountant
Potomac Electric Power Co

For the past month electric companies have been getting necessity certificates permitting them to accelerate tax amortization of certain facilities. The certificates may play a big part in the financing of construction programs.

Certificates Granted by DPA

The Defense Production Administration is granting the certificates under Section 216 of the Revenue Act of 1950. This permits taxpayers to amortize "emergency facilities" for tax purposes over a period of 60 months in lieu of normal depreciation. Applications may be filed for certification of facilities (land, buildings, and equipment) which are constructed or purchased.

DPA limits accelerated amortization to that portion of the economic life of the facility which is expected to expire during the emergency period or to that portion of the investment traceable to the production demands of the emergency period by certifying only a percentage of the total cost of an asset.

Aim Is to Spur Expansion

Emergency facilities can be amortized at a rate of 20% a year in lieu of depreciation which might normally be as low as 1%. The purpose is to encourage expansion of facilities essential to war mobilization which may have limited post-emergency usefulness. This privilege is supposed to minimize cash requirements for construction and afford speedy tax relief at optimum tax rates, thus encouraging investment in plant expansion under difficult and unstable conditions.

Although tax amortization affords some relief to taxpayers who have working capital and financing problems, it does not return the full investment nor does it afford immediate relief. Actual relief depends upon the industry but it is less than the 85.5% relief usually obtained under the law prevailing during World War II. Cash relief is delayed also until at least the year after the year in which the facilities are completed or acquired—the year in which the tax is payable.

Full effect of tax amortization may be further postponed. If a construction project started in early '50 is not completed until late in 1952, material relief is deferred until 1954 when taxes are payable for 1953 (the first year full relief is obtained). Low-cost temporary financing may be used advantageously to bridge this gap and minimize permanent financing requirements.

But even when a utility has received a necessity certificate, it still has its choice of tax amortization or normal depreciation. Accounting, financing, and regulatory problems must be considered. The advantage of deductions allowable at the higher tax rates usually applicable during a national emergency must be considered especially if a company is in the excess-profits-tax-brackets. But taxes can remain high for a long time.

The company is also faced with the problem of how best to record on its books and in its financial reports depreciation and the tax reduction resulting from amortization.

Even though amortization is taken for tax purposes, normal depreciation may be recorded on the books. However, this might materially distort income because of the reduction in tax-expense during the amortization period. This relief is obtained at the cost of subsequent years when normal depreciation charges will still be required for book purposes without a corresponding tax deduction.

Some utilities may prefer to take normal book depreciation plus an added provision equal to the tax savings resulting from amortization. This method has no effect on earnings during the amortization period, additional depreciation being offset by reduced taxes. After the emergency facility is

Pros and Cons of Accelerated Amortization

Pros—

1. **A bird in the hand is felt to be worth two in the bush, therefore get a tax deduction while you can.**
2. **Some overall tax economy may be effected through tax amortization allowable during high tax rate years, versus depreciation allowable in more normal years at an average rate which will probably be lower.**
3. **Cash and permanent financing requirements are somewhat eased.**
4. **Earnings will show a temporary improvement, even though this effect is actually at the expense of future years.**
5. **The certified facility has limited post-emergency usefulness.**

Cons—

1. **Relief has been limited because Defense Production Administration has only approved amortization of a portion of the facility.**
2. **Corporation is not subject to excess profits tax and anticipates a long period of relatively high tax rates.**
3. **Actual cash relief is deferred for several years after cash outlays for construction have been made.**
4. **Accounting and regulatory problems complicate and substantially negate the advantages gained through tax amortization.**
5. **Certified emergency facilities may have a useful service life far beyond the amortization period, thus amortization may seriously distort earnings statements and balance sheets for many years.**

fully amortized for tax purposes (five years), book depreciation is computed on the undepreciated cost of the asset by spreading the remaining cost over the remaining life. Throughout this period earnings will reflect little distortion because higher taxes, due to no deduction for depreciation, would be practically offset by a reduction in the provision for depreciation for book purposes.

May Reduce Earnings

It is possible to amortize emergency facilities for both book and tax purposes. Then the effect on income will be a reduction in earnings because the tax effect of amortization will not be sufficient to offset the accelerated depreciation expense. Many industries can compensate for this by increasing sales prices to include the accelerated depreciation expense. This is not always possible in the utility industry. Nevertheless, if accelerated amortization is in reality true depreciation, it ought to be included in cost and price in addition to being allowed for tax purposes.

If normal depreciation is elected for book purposes, a question concerning treatment of tax reduction due to amortization must be resolved. Should tax savings be reflected in current earnings? During World War II some utilities used this method. Others recorded the savings in special reserve accounts for postwar conversion, deferred maintenance, or other contingencies. These included reserves to be apportioned to income or surplus in annual amounts sufficient to offset the additional taxes anticipated in post war years due to the reduction in tax depreciation resulting from fully amortized facilities. Many of such contingent reserves have since been transferred to surplus.

Transfer Creates Problems

The annual transfer to income of an amount intended to offset taxes occasioned by the reduction in the deduction for depreciation creates two problems:

1. The reserve required for this purpose cannot be estimated with any degree of accuracy because applicable tax rates for years between the end of the amortization period and the retirement of the asset are unknown and subject to fluctuation.

2. This method results in endless accounting, adjustments, and explanatory notes to financial reports.

Although a utility may get a necessity certificate, there is no law which says it must be used. Some taxpayers do not appear to be so anxious to take amortization as they were a decade ago.

LARGEST 3,600-RPM unit (125,000-kw) in operation anywhere was put on the line recently in Sewaren (N. J.) Plant of Public Service Electric & Gas Co, bringing station capacity to 455,000 kw. Pres George H. Blake started the machine as Pres Gwilym A. Price of Westinghouse Electric Corp, which built it, looked on

Manitoba Board Studies Addition of Steam Plants

Until new hydroelectric plants can be developed in Manitoba, Can., steam generating power plants are likely to be the next source of supply to meeting growing requirements.

The recently appointed Manitoba Hydro-Electric Board has asked H. G. Acres Co, Niagara Falls, consulting engineers, to submit a survey of possible supply sources. The report will also include capital and operations costs involved in use of one or more new large steam stations together with similar information for undeveloped portions of the Winnipeg River.

With plans for reorganization of the province's hydroelectric industry bogged down, it appears unlikely the government will make any attempt to acquire Winnipeg Electric Co and its holdings this year.

NLRB Refuses to Upset Utility-IBEW Contract

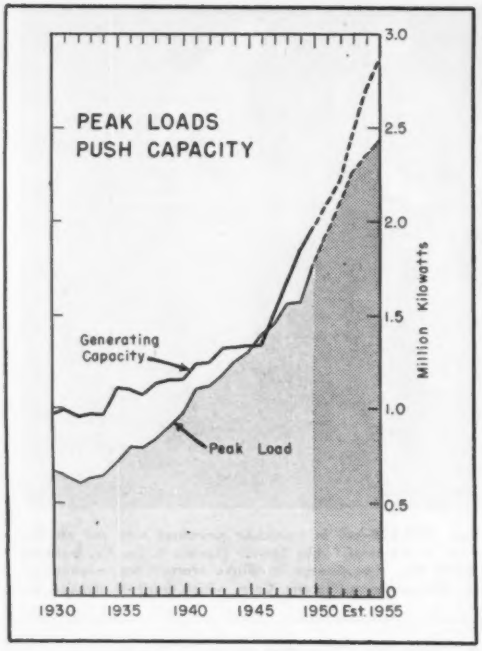
National Labor Relations Board has refused to upset the company-wide bargaining relationship between Montana Dakota Utilities Co and the International Brotherhood of Electrical Workers, AFL. Since 1943, IBEW has bargained for all of the company's production and maintenance employees—both electric and gas—in five states.

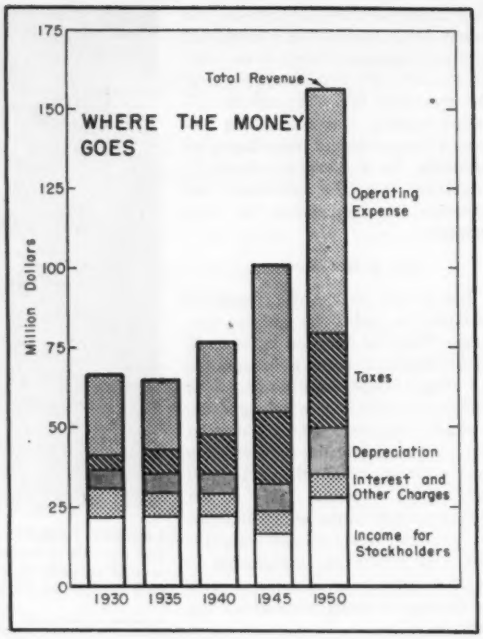
NLRB rejected a petition of the AFL Operating Engineers which asked for a bargaining election among the company's gas production and maintenance employees in five areas in Montana.

The board held it was inappropriate to separate the gas employees from the others in view of the integrated nature of the utility's operations and past company-wide bargaining with IBEW.

World Record at Coulee

The power plant at Grand Coulee Dam produced 42,314,000 kwhr on July 24, a new world's record for 24-hr production. It set the previous record of 41,445,000 kwhr on Jan. 29.





Philadelphia Electric Galloping Ahead

Unlike Fabled Horseman It Rides Wisely in All Directions; Goals Are More Capacity, Bigger Sales, Greater Economies in Operation

If one wants a good description of the Philadelphia Electric Co and its activities, he need only remember the fabled horseman who jumped on his steed and rode wildly away in all directions. But there is some difference. The Philadelphia utility does nothing wildly, and unlike the horseman it will reach the ends of all the roads.

PE's most important roads today lead to:

1. An increase in capacity of 775,000 kw by the end of 1955.

2. An increase in load so that this new capacity will not stand idle.

3. Engineering developments and practices which will lead to greater efficiency and economies in operation.

Since 1947 PE has added 708,000 kw of steam capacity. With the 775,000 kw scheduled or under construction the company will have a total capacity of 2,661,000 kw by the end of 1955.

One unit, the largest of its kind in the world, will be a 200,000-kw, 85 pf, 3,600 rpm, single-shaft machine. The steam end will be a tandem-compound, triple-exhaust turbine which uses steam at 1,800 psi throttle pressure and 1,000/1,000 F., reheat. Westinghouse Electric Corp, a PE customer, will build the unit at its South Philadelphia Plant.

This unit is one of the progressive engineering steps being taken by the company. It will require but 0.66 lb of coal to produce 1 kwhr of electric energy. The first plant of the company required 8 lb per kwhr. At present the best station requires 0.91 lb per kwhr. By the end of 1955 the system fuel rate is expected to be 0.90 lb instead of the present 0.99 lb.

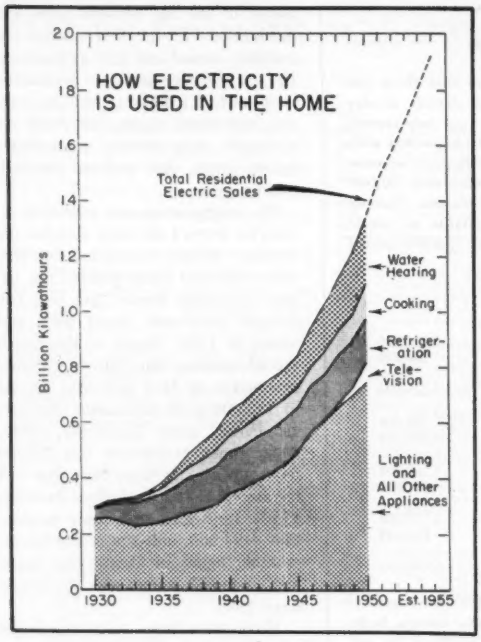
Generating Capacity Added Since 1945 Planned Through 1955

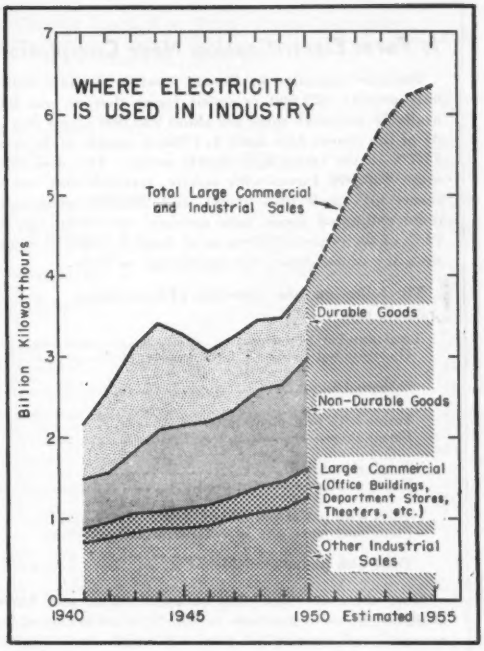
Station	Added Since 1945	Planned Through 1955	Total	Year
Southwark	182,000	.....	182,000	1947
Southwark	182,000	.....	182,000	1948
Barbadoes	132,000	.....	132,000	1949
Richmond	30,000	.....	30,000	1949
Richmond	182,000	.....	182,000	1950
Delaware	.....	125,000	125,000	1952
Delaware	.....	125,000	125,000	1953
Cromby	.....	150,000	150,000	1953
Cromby	.....	200,000	200,000	1954
Unassigned	.....	175,000	175,000	1955
	708,000	775,000	1,433,000	

The big unit will go into the Cromby Plant on the west bank of the Schuylkill River north of Phoenixville. A 150,000-kw unit at this plant is scheduled for operation in 1953.

This big increase in capacity has led the company to consider even more closely than ever its future load. Present forecasts are that by the end of 1955 capacity will top load by about 500,000 kw (See chart).

PE is acting now to build load for some of that surplus capacity. In its estimates for the future the company took into consideration the construction by the United States Steel Corp of a plant at Morrisville, about 30 miles northeast of Philadelphia. This





plant in itself will be a big customer. But the thousands of employees mean a big jump in residential and commercial load. It is estimated that the steel plant and the many other industries, large and small, which are starting operations in PE's territory will add 700,000 employees to payrolls.

One of the best ways to build load, the management believes, is to promote the Port of Philadelphia as a site for other industries. A national advertising campaign is now being conducted to promote this idea. The first ad appeared June 30 in the "Saturday Evening Post," PE customer.

This insertion, which company officials claim has brought very favorable reaction from industries throughout the nation, is to be followed by others in "Time," Forbes," and "Business Week". All of these ads are to be in four colors. It is believed that this is the first time that an electric utility has conducted such a campaign in four colors. Black and white ads are to appear in the "New York Times" and the "Wall Street Journal."

However, even without any gains brought about by this advertising campaign PE sales have been constantly rising. (See table and charts). The greater sales can be explained by the increase in customers and the greater usage by all customers. There were 744,000 customers at the end of 1940 and 938,000 at the end of 1950. Most of the increase fell in the residential classification which rose from 617,000 to 785,000. Average residential use increased in the same period from 1,091 kwhr to 1,896 kwhr a year—1,966 kwhr as May ended.

On June 1 the company had 116,000 ranges and 70,000 electric water heaters on its lines. This is a saturation of 16% and 10% respectively. These electric statistics are remarkable for PE is a combination company which serves 175,000 gas customers in portions of five suburban counties adjacent to Philadelphia, though not in the city itself.

The money angle must necessarily be inserted into the company picture. Its five-year construction program (1951-1955) will require $320 million of which $286.5 million will be for the electric system. But all revenues, net income, and earnings for common stock have been rising (See chart). Last year the common dividend was increased from $1.20 to $1.50 a year.

So the company plans to raise only $150 million of new money. The remaining $170 million will come from internal sources.

The company has been quick to avail itself of the latest technical developments. It is now building a microwave system to link its Richmond Plant with the Camden switching station of Public Service Electric & Gas Co. This installation will make possible a three-mile direct communication and relaying link instead of a 40-mile carrier system.

Sales Have Been Increasing Steadily

	1940	1945	1946	1947	1948	1949	1950
Energy Sales (Million Kwhr)							
Residential and Rural	642	847	946	1,019	1,121	1,203	1,340
Commercial and Industrial—Small	504	606	730	831	942	983	1,058
Commercial and Industrial—Large	1,752	3,295	3,051	3,226	3,462	3,465	3,879
Railroad and Railway	974	1,285	1,288	1,265	1,260	1,169	1,154
Public Authorities and Highway Lighting	43	56	55	65	81	93	97
Other Electric Co's and Interdepartmental	275	414	390	478	536	509	584
Total Sales	4,190	6,503	6,460	6,884	7,402	7,422	8,112

Is Farm Electrification Near Completion?

Statistics compiled by Edison Electric Institute indicate that there are only around 229,000 occupied farms that do not have electric service available, although there are about 929,000 farms that are not now served. As of the census date April 1, 1950, a sample of 26 states shows that only 77.7% of the farms had electric service. This does not take into account some 400,000 farms with service available but not connected, 50,000 farms with their own plants, and 250,000 unoccupied farms. Taking these estimated items into account, electricity was available to about 91% of the occupied farms as of April 1, 1950. A total of 250,000 added since the census raises this percentage to 95%.

The following table gives the EEI estimates:

April 1, 1950

Total number of farms	5,379,000
Operator not living on farm (unoccupied)	250,000
Occupied farms	5,129,000
Farms with own plants	50,000
Farms on power lines	4,200,000
Total electrified	4,250,000
Power available but not used	400,000
Total with power available 4/1/50	4,650,000
Electrified since 4/1/50	250,000
Total with power available	4,900,000

Since there are 5,129,000 occupied farms and 4,900,000 have power available, power is available to 95.5% of all occupied farms. Farms, both occupied and unoccupied, total 5,379,000. As 4,200,000 of these are on power lines, 78% of all farms are being served.

Appliance Output Lags, but Blame Lack of Buyers Not of Materials

The appliance-radio-TV industry knows now that it was absolutely right in expecting trouble in 1951—but dead wrong in anticipating the source of that trouble.

As the industry totaled up its five and six-month production figures it was obvious that production was falling—as expected. But the slump was due more to a lack of customers than to the anticipated shortage of raw materials. The industry's unexpected plight was summarized by one refrigerator manufacturer who complained that "the government tells me how little metal I can use and how I can use it, and I still can't sell the units I do manage to make."

The big boys of the industry—the refrigeration manufacturers — were among the hardest hit. After setting a new monthly high in March (a traditionally healthy month for refrigerator production) the industry's output skidded until in June only 309,000 units were turned out. That's more than 280,000 short of March's record, 240,000 behind June of last year, and the worst June since 1947 when the industry was still building its productive muscles. Thanks to its booming first quarter, however, the industry's six month totals were only 15% behind 1950 and were ahead of any other comparable period.

As production fell, inventories reached record highs. The television industry, which in late 1950 had some 53,000 units in factory inventory reported that as of mid-July there were 740,000 sets in manufacturers' warehouses. A Chicago warehouseman reported in mid-June that the back-up of appliances had filled that city's warehouse space to between 95 and 100% of capacity.

Television manufacturers, like their appliance brethren, were painfully aware of the lag between sales and production. In the first quarter the industry turned out 2.2 million sets. In the second quarter production dropped to 1.1 million. And July output, with many plants shut down for vacations, was running considerably below even the reduced second-quarter pace.

The refrigeration and television industries weren't the only ones having trouble. Range production in May fell to 109,000 units, almost 25% behind the same month last year (although five-month totals were still ahead of 1950, thanks to this year's record-breaking first quarter). Washer production in May and June dipped to 253,000 units per month, the lowest figures since December, 1949. June ironer production was 24,500 units, up slightly from May, but still the second lowest mark since January, 1950. June vacuum cleaner production (194,000 units) was the lowest monthly figure in almost two years, and six-month output was the lowest since 1946.

There were some relatively bright spots in the picture. Radio production held up surprisingly well. Six-month production was just over the 8-million mark; second quarter production amounted to 3.8 million of this total.

Freezer production in May fell to 56,600 units, 21,000 less than the record established in March. But even this reduced volume was 53% ahead of May last year and five-month totals (334,600) were ahead of 1949's entire 12-month output.

But despite bright spots like freezers and radios, gloom lay heavy on the industry as mid-summer wore on. It took a hardy soul to concede that things might not be as black as they seemed and to point out that competing against 1950's record-breaking figures was a trifle academic. With so much advance buying in 1950 it was small wonder that sales had dropped off in 1951. Compared to 1949, for instance, this year's figures so far looked pretty good.

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New PSC Official Named

The new secretary of the Mississippi Public Service Commission is Archie McDuffi. McDuffi succeeds Sam Wilhite.

May Energy Sales Rise 13.7% Over Level of 1950

Sales of electrical energy in May exceeded those for the same month a year ago by 13.7%.

Electric utilities sold 25,466,691,000 kwhr to ultimate customers in May of this year compared with 22,394,246,000 in May, 1950. Revenue from ultimate customers totaled $451,676,000, or 10.9% more than the $407,411,300 received in May last year.

Classification of Sales, May

Kilowatthour Sales May	Million Kwhr 1951	1950	Per Cent Change
Residential or domestic	5,949	5,235	+13.6
Rural (distinct rural rates)	708	634	+11.6
Commercial or industrial			
Small light and power	4,482	3,919	+14.4
Large light and power	12,937	11,300	+14.5
Street and highway lighting	231	206	+12.1
Other Public Authorities	648	581	+11.5
Railways and railroads			
Street and interurban railways	273	274	−0.2
Electrified steam railroads	191	194	−1.3
Interdepartmental	47	52	−9.9
Total to ultimate customers	25,467	22,394	+13.7

Average usage per residential or domestic customer reached 1,904 kwhr in the 12 months ended May 31, 1951. This represents a rise of 8.6% over the average usage of 1,754 for the same period a year before. The average annual bill amounted to $54.26, up 6.3% from $51.04 for the 12 months ended May 31, 1950. Revenue per kilowatthour declined 2.1% from 2.91¢ to 2.85¢.

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June Energy Production Up 11.8% Over Year Ago

Electric utility production of energy for June of this year is the highest total for June on record. The Federal Power Commission reports that output in June was 29,839,806,000 kwhr. This is an increase of 11.8% over production in June, 1950.

June output, however, was 0.1% below the 29,871,064 kwhr produced during May, 1951.

Production for the year ended June 30, 1951, passed the 350 billion kwhr mark for the first time, reaching a record 351,774,420,000 kwhr. It exceeded by 0.9% the previous record of 348,619,690,000 kwhr set during the twelve months ended May 31, 1951, and was 15.6% more than output during the year ended June 30, 1950.

Water power plants produced 8,020,994,000 kwhr in June, an increase of 0.5% over June, 1950. As a percentage of June total production, water power output decreased from 29.9% last year to 26.9% this year. Fuel plants produced 21,818,812 kwhr during June.

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Tidewater Plans Plant

Tidewater Power Co has announced it will construct a 150,000-kw steam plant near Wilmington, N. C. The plant is scheduled to go on the line in 1954. Until now, Tidewater has purchased power from Carolina Power & Light Co and has served only as a distributor.

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General Counsel Resigns

G. Edward Friar, general counsel for the Tennessee Railroad and Public Utilities Commission, has resigned effective August 1.

Changes in Capacity Reported to Federal Power Commission

PLANT ADDITIONS DURING JUNE

State	Utility	Plant	Fuel	Capacity (Kw)
Mass.	Hudson Light & Power Department	Hudson	IC	3,000
Pa.	Metropolitan Edison Co	Titus	S	75,000
Ill.	Rantoul Water & Light Plant	Rantoul	IC	1,233
Ill.	Commonwealth Edison Co	Ridgeland	S	150,000
Mich.	Northern Michigan Electric Cooperative	Tower	IC	1,313
Mich.	Wyandotte Department of Municipal Service	Wyandotte	S	11,500
Wis.	Dairyland Power Cooperative	Alma	S	17,250
Mo.	Kansas City Power & Light Co	Hawthorn	S	66,000
Neb.	Callaway Municipal Light Department	Callaway	IC	108
Md.	Eastern Shore Public Service Co of Maryland	Vienna	S	30,000
Ga.	Thomasville Water & Light Department	Thomasville	S	5,000
Fla.	Florida Power Corp	Higgins	S	40,000
Fla.	Florida Public Utilities Co	Fernandina	IC	1,485
Ky.	Henderson Municipal Light Department	Henderson	S	10,000
Miss.	Mississippi Power Co	Sweatt	S	40,000
Okla.	Blackwell Municipal Light & Water Department	Blackwell	S	8,000
Okla.	Public Service Co of Oklahoma	Elk City	S	6,000
Tex.	Southwestern Public Service Co	East	S	37,500
Tex.	West Texas Utilities Co	Spur	IC	750
Tex.	Lubbock Light Department	Plant No. 2	S	7,500
Tex.	Lower Colorado River Authority	Granite Shoals	H	45,000
Ariz.	Bureau of Reclamation	Davis Dam	H	45,000
Utah	Uintah Power & Light Co	Duchesne	IC	300
Wash.	Bureau of Reclamation	Coulee Dam	H	108,000
Ore.	California-Pacific Utilities Co	Long Creek	IC	175
Calif.	Southern California Edison Co	Big Creek No. 4	H	48,000
Calif.	Pacific Gas & Electric Co	Moss Landing	S	100,000
Calif.	Pacific Gas & Electric Co	Contra Costa	S	103,500

PLANT RETIREMENTS DURING JUNE

Wis.	Wisconsin Public Service Corp	Wausau East	H	780
Wis.	Wisconsin Power & Light Co	Berlin	S	1,250
Minn.	Otter Tail Power Co	Twin Valley	S	752
Ky.	Henderson Municipal Light Department	Henderson	S	5,000
Ark.	Arkansas Power & Light Co	El Dorado	S	1,000
Okla.	Watonka Light Department	Watonka	IC	452
Tex.	West Texas Utilities Co	Junction	IC	750
Utah	Parowan Electric Department	Parowan	H	360

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of July 1—Hydro, 18,432,731 kw; Internal Combustion, 1,943,068 kw; Steam, 51,916,475 kw; Total, 72,292,274 kw.

REA Report Reveals Power Use Raised 25%

Although there was a gain of less than 9% in the number of rural co-op customers during the fiscal year ending June 30, power use shot up 25%.

In its report of the fiscal year, the Rural Electrification Administration said borrowers from the agency are now distributing twice as much power as in 1948 and three times as much as in 1947.

During the fiscal year, REA borrowers energized about 117,000 miles of line and added 288,000 customers —an average of 2.5 connections per mile. REA borrowers now operate an estimated 1,286,127 miles of line serving 3,896,127 customers.

Loans approved during the fiscal year totaled $221,734,000, of which 23% went for generation and transmission facilities. Such loans now account for 18% of all REA loans.

The government was repaid about $37 million in principal and $14.5 million in interest. Payments overdue 30 days or more were $687,000.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1951									
Aug. 2	2.90	2.96	3.12	4.08	4.27	4.66	5.52	6.18	7.02
July 26	2.90	2.95	3.10	4.10	4.30	4.67	5.53	6.23	7.07
END OF QTR.									
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25

Data: Reis & Chandler, Inc.

Georgia Power Seeks $4.2 Million Rate Boost

Georgia Power Co is arguing its case for a 8%, $4,275,000 annual rate increase before the Public Service Commission. The hearings got underway last week.

Harllee Branch, Georgia Power president, said the rate boost is necessary to attract new capital to finance the company's expansion program. He also gave increased operating costs as a reason for the request for higher rates.

Herman W. Boozer, vice president and comptroller, told the commission that the rate increase would mean only $1,902,414 in additional gross income. Higher taxes, he said, would eat up $2,354,586 of the proposed increase.

Three other companies are also requesting rate increases from state authorities. Wisconsin Power & Light Co is asking for a boost of 7% in its rates. Western Massachusetts Electric Co has applied for a raise of $1,203,900. In Texas, Community Public Service Co seeks a rate increase in Leonard.

FINANCIAL BRIEFS

Pennsylvania Electric Co is planning to raise $11 million ($5 million of first mortgage bonds and $3 million each of preferred and common stock) to finance construction . . . **Columbus & Southern Ohio Electric** is planning to sell competitively $12 million of first mortgage bonds on Sept. 5 for construction purposes.

Wegener & Daly, Boise, Idaho, has been offering 35,000 shares of Idaho Power Co 4% preferred stock at $100 since June 5, 1951. As of Aug. 1 the underwriters had purchased 10,000 shares of the stock from the company and had been granted an option to Oct. 10, subject to renewal by mutual agreement of the parties, to purchase the remaining 25,000 shares. The company has spent about $9.4 million during the first six months of 1951.

Public Service Co of Indiana has placed privately 40,000 shares of common stock at $30.125 per share.

Boston Edison Co has been granted a $197,000 increase in its street lighting rates, effective Jan. 1, 1952 . . . **Orcas Power & Light Co** is cutting rates 10% on power delivered to San Juan Islands in Puget Sound . . . **Ninnescah Rural Electric Cooperative Association,** Pratt, Kan., has been authorized by the state commission to decrease rates for customers using less than 134 kwhr a month and for large industrial users. Those using more than 134 kwhr will pay higher rates.

Federal Power Commission has scheduled a hearing on Nov. 14 in the proceeding involving South Carolina Public Service Authority's claim for exemption for payments of annual charges from 1942-47 made under its FPC license from the Santee-Cooper hydroelectric and navigation project.

In declaring a stock dividend of one share for each 20 held along with the regular cash dividend of 75¢, both payable Sept. 10, directors of American Gas & Electric Co said, "If we're to continue to attract investors' savings, as we must if we are to finance successfully our current building program, we need also to be concerned about the stockholders' return."

Boston Edison Co has asked the Massachusetts Department of Public Utilities to prohibit owners of large buildings from reselling electricity. The company estimates it loses $1 million annually through submetering.

Transfer of 26 miles of its rural lines to the Washington Water Power Co for $45,562 has been completed by the City of Chewelah. Voters approved the sale, 4 to 1, in a special election in June.

Canadian Collieries (Dunsmuir) Ltd has sold its hydroelectric plant on the east coast of Vancouver Island to the British Columbia Power Commission for $1,181,250. The commission will increase the capacity of the Puntledge River Plant from 12,000 hp to 23,000 hp.

Approximate average age of all its depreciable electric properties is 13.2 years, Rochester Gas & Electric Corp has announced.

Edison Sault Electric Co, Saulte Ste Marie, Mich., has purchased Manistique (Mich.) Light & Power Co.

The purchase of electric properties of Mooresville Public Service Co by Indianapolis Power & Light Co for $125,000 has been approved by the Indiana Public Service Commission.

Long Island Lighting Co has applied to the Securities and Exchange Commission for an order declaring it has ceased to be a holding company.

Electric Utility Financing—July 28-Aug. 4

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
Bonds				
Central Vermont Public Service	1st mtg "G" 3½%, 1981 new money	$2,000	102.346%	3.375%
Common Stock				
Rochester Gas & Electric	175,000 sh new money	5,513	$31.50	7.11

Promoted by USBR

Vaud E. Larson has been appointed head of Region III Branch of Project Planning of the Bureau of Reclamation. Larson will move to Boulder City, Nev., from Phoenix, where he was assistant regional planning engineer in charge of the investigations office.

Power Contract Signed

The city of Ocals, Fla., has signed a contract with Florida Power Corp to have the utility furnish power for another five years beginning Dec. 31. The new contract fixes cost of energy at 6 mills per kwhr plus $1 per kw demand and a fuel oil adjustment.

MEETINGS

American Institute of Electrical Engineers
Pacific General Meeting, Multnomah Hotel, Portland, Ore., August 20-23; Fall General Meeting, Hotel Cleveland, Cleveland, Ohio, October 22-26.

Pacific Electronic Exhibit
Civic Auditorium, San Francisco, August 22-24.

Illuminating Engineering Society
National Technical Conference, Hotel Shoreham, Washington, D. C., August 27-30.

Northern California Electrical Bureau
Annual Exposition, Civic Auditorium, San Francisco, September 1-9.

Rocky Mountain Electrical League
Fall Convention, La Fonda Hotel, Santa Fe, N. M., September 9-12.

Edison Electric Institute
Commercial Cooking Committee, EEI Headquarters, 420 Lexington Ave., New York, September 10-11; Prime Movers Committee, Statler Hotel, Buffalo N. Y., October 1-2; Meter-Service Committee, Purdue University, Lafayette, Ind., October 1-3; Electrical Equipment Committee, New Ocean House, Swampscott, Mass., October 8-9; Transmission-Distribution Committee, Sheraton Hotel, Rochester, N. Y., October 10-11.

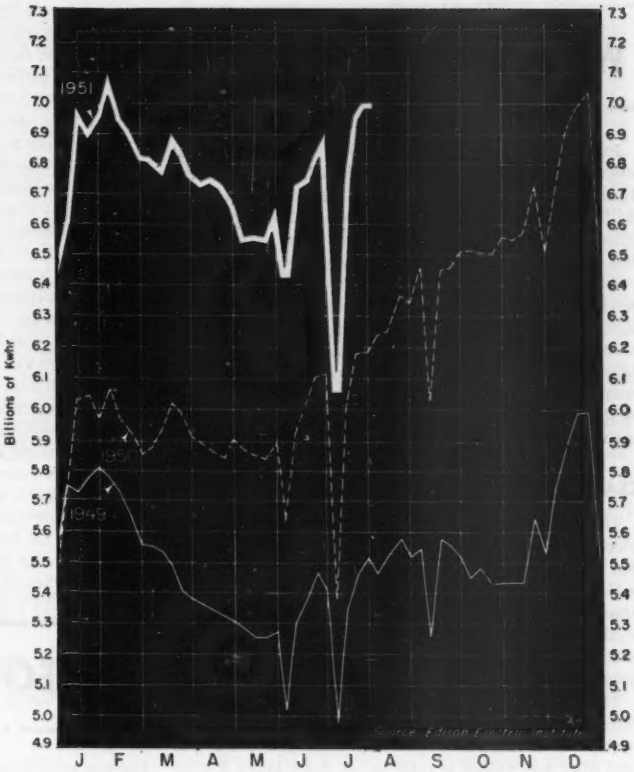
Instrument Society of America
National Instrument Conference-Exhibit, Sam Houston Coliseum, Houston, Tex., September 10-14.

★Northwest Public Power Association
Joint Meeting with Montana REA Assn., Hotel Florence, Missoula, Mont., September 12-14.

International Association of Electrical Inspectors
Southwestern Section, Hotel Lafayette, Long Beach, Calif., September 13-15; Northwestern Section, Hotel Davenport, Spokane, Wash., September 19-21; Western Section, Hotel Fontenelle, Omaha, Neb., September 25-27; Eastern Section, Hotel Claridge, Atlantic City, N. J., October 1-3; Southern Section, Hotel John Marshall, Richmond, Va., October 15-17.

★Pennsylvania Electric Association
Annual Meeting, Benjamin Franklin Hotel, Philadelphia, September 18-19; Transmission-Distribution Committee, Hotel Concord, Northeast, Pa., October 11-12; Hydraulic Power Committee, Irem Temple Club, Dallas, Pa., October 11-12; Joint Relay-Communications Committee, Emerson Hotel, Baltimore, Md., October 18-19; Electrical Equipment Committee, Penn Alto Hotel, Altoona, Pa., October 22-23; Meter Committee, Arlington Hotel, Oil City, Pa., October 25-26.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, September 20-21.



Output Week Ended Aug. 4—7,003,209,000 Kwhr

Weekly Output, Millions Kwhr

1951	1950	1949
Aug. 4 7,003	Aug. 5 6,247	Aug. 6 5,466
July 28 7,005	July 29 6,190	July 30 5,518
July 21 6,975	July 22 6,186	July 23 5,462
July 14 6,739	July 15 6,006	July 16 5,342
July 7 6,077	July 8 5,380	July 9 4,982
June 30 6,898	July 1 6,115	July 2 5,410
June 23 6,835	June 24 6,102	June 25 5,466
June 16 6,747	June 17 6,012	June 18 5,373
June 9 6,734	June 10 5,921	June 11 5,300
June 2 6,445	June 3 5,632	June 4 5,018

Percent Change from Previous Year

	Aug. 4	July 28	July 21
New England	+ 4.3	+ 6.8	+ 6.8
Mid-Atlantic	+ 9.3	+11.9	+11.9
Central Industrial	+ 8.5	+10.8	+ 9.8
West Central	+15.0	+14.5	+10.9
Southeast	+12.0	+12.4	+13.7
South Central	+26.9	+29.0	+28.2
Rocky Mountain	+11.5	+11.9	+13.4
Pacific Coast	+15.6	+13.6	+13.0
Total United States	+12.1	+13.2	+12.8

Wisconsin Utilities Association
Accounting Section, Plankington Hotel, Milwaukee, Wis., September 20-21.

Public Utilities Association of the Virginias
Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., September 21-22.

American Society of Mechanical Engineers
Fall Meeting, Hotel Radisson, Minneapolis, Minn., September 25-28.

Iowa Utilities Association
Management Conference, Fort Des Moines Hotel, Des Moines, Iowa, October 1-2.

Southeastern Electric Exchange
Engineering-Operation Section Conference, John Marshall Hotel, Richmond, Va., October 4-5; Sales Conference, Roosevelt Hotel, New Orleans, La., October 31, November 1-2.

National Farm Electrification Conference
Annual Meeting, Hotel Gibson, Cincinnati, October 9-10.

National Electrical Contractors Association
Annual Convention, Shoreham Hotel, Washington, D. C., October 9-12.

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 10-12.

International Association of Electrical Leagues
Annual Conference, Roosevelt Hotel, New Orleans, October 10-13.

Association of Edison Illuminating Companies
Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., October 11-13.

National Association of Railroad and Utilities Commissioners
Francis Marion Hotel, Charleston, S. C., October 16-19.

★National Association of Corrosion Engineers
South Central Region Meeting, Robert Driscoll Hotel, Corpus Christi, Tex., October 18-20.

National Electronics Conference
Annual Conference, Edgewater Beach Hotel, Chicago, October 22-24.

American Standards Association
Annual Meeting, Waldorf-Astoria, New York, October 22-24.

★Addition this week.

WASHINGTON COMMENT

JESSE MOCK

Ironic as it may sound, the government agency most reluctant to celebrate "Farm Electrification Week" is the Rural Electrification Administration. The event, to be held the last week in August, is being sponsored by a group of privately owned utilities to commemorate the near-completion of the farm electrification program.

But REA appears caught in the middle. It wouldn't mind taking credit for helping in the job of electrifying farms. But, it sees the pat on the back as an effort to push it out of business. Nor is it entirely sure how to go about defending itself against its own accomplishments. It has been decided that REA will not carry on an open attack on the celebration. Administrator Claude R. Wickard said last week he would have no statement on the event.

REA Can't Openly Attack Celebration . . .

The agency is ill-equipped to carry on an open nationwide counterattack. It would readily be apparent that it was fighting for its continuance. It has cultivated few publicity outlets in cities or small towns, where the "Electrification Week" celebrations will be centered. And it would not like to offend Congress by putting on a public relations campaign at government expense. Thus, any counterattack must be undercover.

The pattern of the government counterattack was partially revealed when President Truman blasted the coming celebration as a "publicity stunt" (EW, Aug 6, p 5). The long letter was written in reply to one from James Patton, president of the National Farmers Union. Patton asked the president to investigate thoroughly the motives behind the celebration before permitting government officials to participate.

Evidently aiming his own missive at newspaper front pages, the President raged against the celebration but did not get around to discussing the real point in the Patton letter. But as far as could be determined in Washington, no member of the executive branch has been invited to participate in the series of events which are a part of the week-long celebration.

. . . But the Co-ops Can and Are

Publications of member co-ops and allied groups have also been carrying the REA side of the fight. Some of those with state-wide or nationwide circulation have been devoting more and more space to slashing away at the celebration, implying it is a stab in the back of the farm electrification program.

At REA headquarters, the official attitude seems to be that "we're so busy trying to bring electricity to farms that we simply haven't paid much attention to the celebration." Officials point out there is now on hand loan applications for more than $325,107,000—which doesn't indicate to them the farm electrification program is finished.

The only public action yet taken by REA to combat the effects of "Electrification Week" is to reshuffle its progress-report figures and come up with the statement that it is not doing as well as it thought it was.

Under law, the agency is required to determine annually the number of farms receiving central station electric service. June 30, 1950, it estimated that nearly 87% of the nation's farms were electrified. By the end of December, it set the figure near 89%.

These are the figures it takes before Congress each year in asking for funds to carry on the next year's work. However, in comparing these estimates with 1950 census figures, REA said its own figures were some 10 to 12% off on a nationwide basis. In some states, REA said, its own estimates have been off by nearly 20%.

Using a slightly different approach, the private utilities contend that electricity is now available to about 95% of America's farms. REA will not buy this wording or figure, but it is more than willing to latch on to the census figures which are based on the 26-state sample. On this basis, REA says indications are that only 78% of the farms are electrified—not the 87% it had claimed last year.

It would seem, off hand, as if REA will have a problem when it goes before Congress next year to ask for appropriations. Will it go on using its own estimates of progress made in farm electrification? Or will it use the census figures and tell Congress that even with the money made available during the present fiscal year, it is still trying to do what it thought was completed last year?

TECHNICAL NOTES

ARCHER E. KNOWLTON

Ladders may be unsafe if a rail has spiral grain; the condition can often be detected by resorting to "splinter lift."

Communication has hardly ever been equal to the requirements during extensive system emergencies.

Utility line foremen number about 35,000.

Electric furnace purchasers habitually crowd to get more out of them as the crews become experienced; worse yet, they buy more kva than they acknowledged when the utility extended its lines. Plan generously.

Plant shut-down during bombing attack will likely result in less equipment damage.

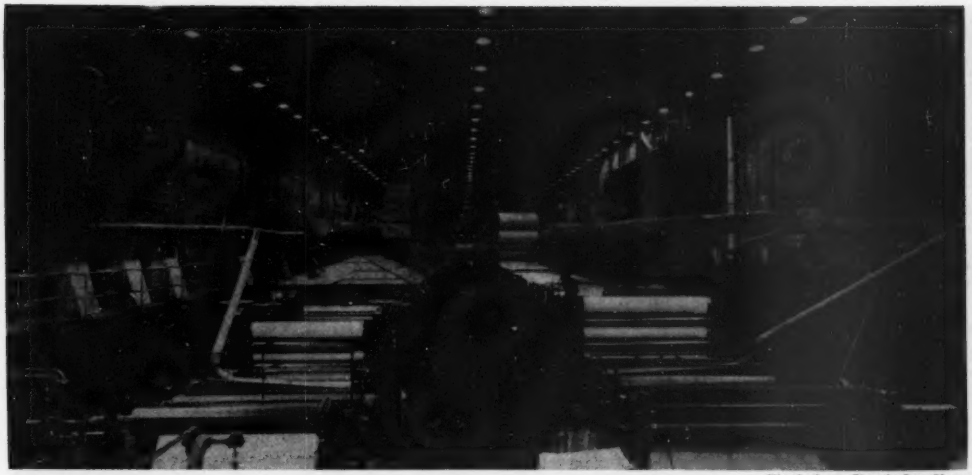
Corona on new high voltage conductors decreases during the first month as the surfaces become smooth from weathering.

Telemetering once lagged 12-15 seconds behind changes in telemetered quantities; indications can now be derived in ½ sec.

Linemen's leather belts should never be hung near heat; this may be forgotten in connection with heated truck-cabs.

Bull-dozers have to precede before fire-fighting apparatus can be effective in bombed areas.

High voltage corona increased with voltage faster than the radio interference but the latter can be appreciable at voltages giving negligible corona.



Westinghouse Electric Corp Photo

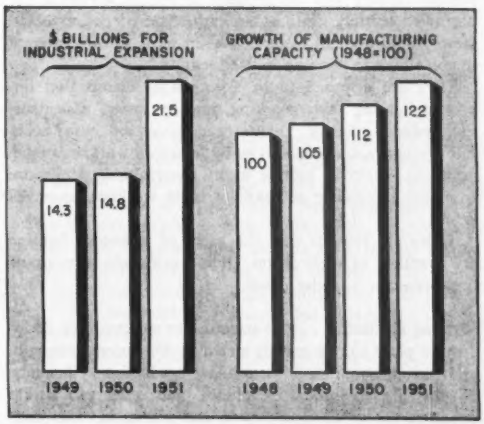
EASIER SERVICING and repair of machines and quicker detection of flaws are results of relighting this paper mill. Dust- and vapor-tight units with 1,000-watt lamps in widespread reflectors provide maximum diffusion and prevent harsh shadows

Better Industrial Lighting— "Must" Tool For Today's Job

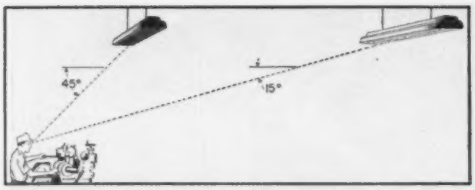
Unit productivity is climbing a scant 1% a year although $22 billion a year is being spent for new plant. Better lighting can boost the rate but only if users accept its "tool value." Why they haven't . . . and what can be done about it is explained in this article

American industry has taken on two responsibilities. One is production of military goods in such quantity as will prevent a third world war, or win it if it is not prevented. The second, after getting over the hump of initial effort for the first, is restoration of production of civilian goods to the ever-increasing volume to which the people of this country are accustomed. Industry will attain the production levels required for discharge of these responsibilities in two ways. One is increase in size of plant. The other is increase in productivity of labor. To the latter, improved lighting can be an important contributor.

The industrial plant of the nation is being increased in a program of expansion that has no previous parallel here or anywhere in the world. This year, capital expenditures for new industrial plant will be around $22 billion. This rate of expansion is expected to continue through the 5-year period, 1951-1955, to make a total new plant investment of well over $100 billion. The accompanying charts show the size and speed of this expansion. One shows capital expenditures for 1949, 1950, and 1951 and the other the increase in output capacity of manufacturing, 1948 through 1951.



MORE MONEY is now being laid out in expansion of industrial plants than ever before and production capacity of manufacturing industries is up more than 20% above 1948



GLARE from light sources in field of worker's vision is common fault of industrial lighting. Usual fixture has cut-off angle of less than 15 deg from horizontal. Fixtures are available with larger cut-offs. Illustration shows how angle can be increased by addition of louvres to the lighting fixture

Expansion Not Enough . . . Big as it is, this expansion program will not, by itself, be sufficient to accomplish the two tasks that industry has undertaken. The new plants, now being and to be built, will undoubtedly incorporate in their design every accepted facility for maximum production. But they are only a part, and not at all the larger part, of the total industrial plant of the nation. And to attain the twin goals of maximum military and civilian production will require maximum output from existing as well as new plant. For the nation to have both guns and butter as is intended, the utmost in efficient operation of all—not just new-production facilities will be necessary. This means increase in productivity and a rise in output per manhour, per dollar of investment and of operating cost, all along the line for both old and new plants. Improved lighting is a "must" if this increase in productivity is to be fully realized.

Seeds of Skepticism . . . Illuminating engineers in their professional organizations, electric utilities in their promotional activities, and makers of light sources and fixtures all agree on this necessity for improvement in industrial lighting. It is natural that they should. They are the sellers of it. But the users of industrial lighting do not all, in fact very few of them, join in that agreement. This also is natural. They are, in the main, satisfied with their present lighting and are inclined to regard argument for improved lighting more as an expression of desire to sell lamps, fixtures, and electricity than as a sincere attempt to contribute to increase in productivity.

They are disposed to be skeptical of claims that improved lighting saves working time by faster, easier seeing; reduces spoilage, rejects, and errors by more accurate seeing; raises productivity by lessening worker fatigue; improves employee morale by its cheerfulness; gets more from the experience and skill of older workers; promotes safety.

There are reasons why the users of industrial lighting are skeptical of such claims. It is worthwhile to examine these reasons in some detail.

Lighting Is Elastic . . . The structure or structures of an industrial plant can be exactly stated in dimensions, strength, and arrangement for maximum production efficiency. So also the equipment, machines, and other production facilities, are all designed, built, and placed in exact conformity with what is required of them. In every case, except lighting, there are definite minimum limits below which there can be no production at all. An ocean liner cannot be built in a small boat yard. A 6-foot crankshaft can't be machined on a 2-foot lathe. Accompanying the line of requirements for production is a corresponding line of "can't's" defining minimums, rigid and uncompromising.

Not so with lighting. The minimum for lighting is total darkness and even that does not say there can be no production. Blind people work without light and an automatic machine needs none for itself, only for its attendance.

Up from the minimum limits for structures, machines, and other industrial plant equipment, below which no production is possible, extends a range of capability in which is found a level of maximum production efficiency and economy. This level can be calculated mathematically and specified exactly to meet desired performance. A boring machine of certain design, size, and output capacity must go here. A conveyor of definite type, length, width, and speed is to be installed there. Everything in and out of the plant, including the lighting, is decided to be thus and so and is specified in dimension, kind, quality, and required performance, all expressed in figures arrived at by calculation or test. But the lighting specification is a joker; it has no lower limit of "can't," of impossibility, like a conveyor that can't be shorter than specified. It has only an upper limit of cost, usually set too low.

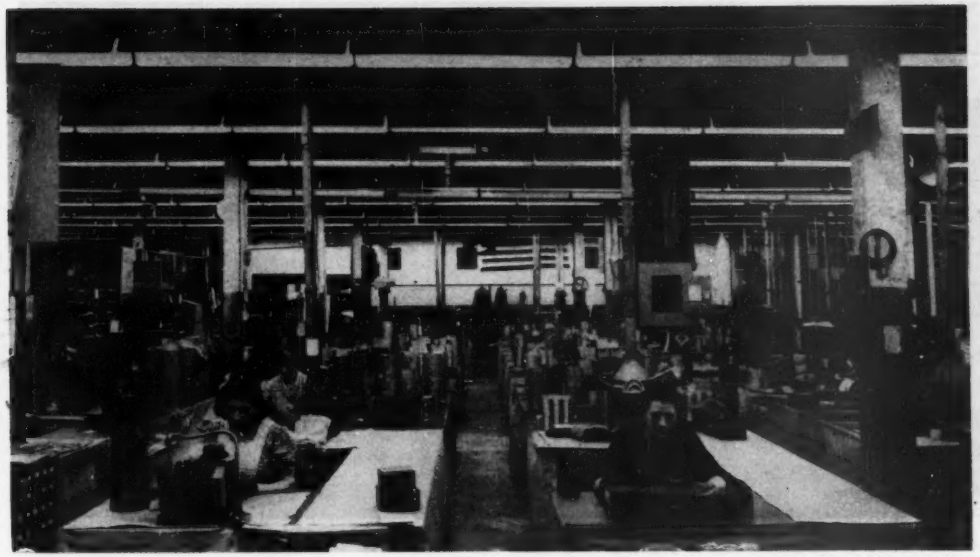
Recommended—Not Specified . . . Of course the lighting is calculated, expressed in figures—foot-candles, brightness ratios, reflectance factors, and so on into the esoteric terms so incomprehensible to the uninitiated. But in spite of its mathematics and the logic of its terminology, lighting can not actually be specified, not in the sense that it must be this and can't be anything less; lighting can only be recommended.

The Illuminating Engineering Society has labored diligently for many years and its labors have been fruitful of much good result. But the result has been recommendations for lighting, not specifications. And the recommendations do not remain fixed. They are revised from time to time, generally into higher ranges. No one can go back in machine production history and find a period when a 2-foot lathe did an acceptable job on a 6-foot crankshaft. But one does not have to go far back to the time when IES recommendations said that 20 foot-candles were perfectly all right for work that now is stated to require 50.

How Much Is "Better" . . . It can be figured and proved mathematically that to increase the speed of a machine by so many RPM will be to raise output by so much. But it does not follow that if light intensity on work is increased so much, production will be raised any proportionate amount. It has been observed that production *is* increased in many cases. How much? That depends—depends on more factors than can be taken into account. And if all the factors could be covered, they would not tell how much because they do not have fixed quantitative values.

Thus it is that the effectiveness of lighting in industrial operations cannot be calculated and measured in hard and fast terms, unchanging and unchangeable, the same here, there, and everywhere, yesterday, today, and tomorrow.

In view of all this, is it any wonder that the users of



General Electric Co Photo

LIGHT REFLECTION from work aids inspection of piston rings. Intensity of 60 ft-c is supplied by continuous rows of 2-tube, 40-watt fixtures, 8 ft apart and mounted 12 ft high. Note rows of lights are perpendicular to worker's line of vision

industrial lighting are inclined to be skeptical of the claims of those who want to sell better lighting?

The Value Is There . . . Yet it is a fact, even though a fact incapable of immutable mathematical statement, that improvement of lighting does benefit the user. Exact statements of universal application, such as, "raising light intensity from 20 to 50 foot-candles will increase production 10%," cannot be made in behalf of improved lighting. But there is a mass of evidence that raising light intensity does increase production. It cannot be proved mathematically that better lighting will reduce accidents in any specific ratio, but the record shows many instances of accident reduction following lighting improvement. It cannot be demonstrated like a theorem in geometry that employee morale is raised by a change from out-of-date to modern lighting, but much testimony to that effect is available. The evidence, the record, the testimony, is all on the side of benefit from lighting improvement.

Productivity Lags . . . There is a particular aspect of benefit from betterment of lighting that is of utmost importance now and in the years ahead. Industrial productivity must be raised, its rate of increase accelerated. It is generally accepted and it is true that output per manhour increases as technical progress continues and more and more capital is invested in machines and other production facilities. But it is not generally known that productivity of labor in manufacturing, which increased at an average rate of 3% per year from 1920 to 1940, rose **only at the rate of 1% per year** in the past decade. There are many reasons for this change, all of them indefinite and difficult or impossible to assess in quantitative terms. Among them is full employment. In a period, as that since 1940, when jobs were plentiful, labor scarce, with military service making heavy demands on manpower, the effect of employment of marginal workers was bound to be felt in productivity. And it is also to be kept in mind that the employee who is sure of his job cannot always be counted on to work his hardest. In the period ahead employment will be high and to the extent that this affects output per manhour, the rate of increase of productivity will tend to remain low or to decline. Modern industrial lighting is a counter force against this tendency because of its nature as an industrial tool.

Lighting or A Rusty File . . . Without his realizing it, lighting is used by the worker somewhat in the way of a hand tool. The difference between good and poor lighting is the difference between the hammer that fits the hand and the one that does not, the file with a sharp bite and the one that is rusty, the chisel with the solid, flat head and the one that is mushroomed over. The worker immediately sees the difference in hammer, file, or chisel and throws aside the poor one. But he does not so readily recognize poor lighting. Most often he does not recognize it at all, becomes conscious of lighting only if it is very bad. Thus his work is hindered and slowed up and he does not know it.

This slowness caused by poor lighting is particularly to be found among older workers. And "older" does not mean doddering senility. It refers to people getting along in their forties and fifties who slowly conclude they'd better get glasses or, wearing them, find that they need bi-focals. There are millions of such workers in industry even when employment is low, and their number will

Westinghouse Electric Corp Photo

LOCAL LIGHTING was avoided here on presses and minimum maintenance accomplished by using 3,000-w mercury lamps 40 ft above the floor, operated on 460-volt power circuit. Intensity is 70 ft-c, lamp life is averaging 8,000 to 10,000 hr

increase in the years ahead, not to speak of those who will keep on working after passing retirement age.

Modern lighting will increase the output of these older workers. It will enable them to produce more with less fatigue than they experienced in producing less under poor lighting. It will do the same for their younger fellows also. And the result will be a contribution towards the acceleration of the rate of increase in output per manhour, which is now so imperatively needed.

Lighting Has "Tool Value" . . . Lighting is an industrial tool, as much a tool as a multiple-head boring machine, an automatic welder, or a chain moving an assembly line. But industry does not fully recognize the tool value of lighting and make the most of it.

That industry does not recognize the tool value of lighting may be questioned on the basis of plants recently and now being built. It may appear that lighting has received due recognition in these plants, and probably it has in many of them. But are they all lighted as well as they would be if every consideration of optimum intensity, direct and reflected glare, brightness contrasts, and all special seeing requirements were taken into account? It would not be difficult to find plenty of illuminating engineers ready to reply, "No," to this question. And even if all the new plants could be graded "perfect" in regard to lighting, it is to be remembered that, as stated earlier in this article, these new plants are not a large part of the whole picture of American industry.

Proportions of Lighting in Manufacturing Costs

Average Values for Factories
4000-Hour Use of Lighting per year
Electricity at 1½¢ kwh

Investment cost per 100 sq ft	25 ft-c		50 ft-c
Lighting and wiring including luminaires, panel boards, and branch circuits	$45		$90
Building costs per 100 sq ft		$1000	
Equipment costs per 100 sq ft		800	
Sub-Total		$1800	
Total including wiring and lighting	**$1845**		**$1890**
Proportional cost of lighting	**2.44%**		**4.76%**

Hourly cost per 100 sq ft for 4000 hours operation per year	25 ft-c		50 ft-c
Lighting and wiring including amortization, lamps, energy, and cleaning	$.0041		$.0082
Building cost including interest, depreciation, taxes, repairs, maintenance, heating, and ventilating		$0.08	
Equipment cost including interest, depreciation, maintenance, and energy for operation		0.05	
Manufacturing labor		1.50	
Sub-Total		$1.63	
Total including wiring and lighting	**$1.6341**		**$1.6382**
Proportional cost of lighting	**0.25%**		**0.5%**

Source: George J. Taylor, Daybrite Lighting Inc

Too Much Not Good . . . It is estimated that only around 15% of present-day industrial lighting is up to modern standards. That this is no exaggeration of deficiency is indicated by the results of the survey made in Indianapolis in 1949 under the sponsorship of a committee of the National Electrical Manufacturers Association. This survey was not made by lighting men intent on finding poor lighting because that was what they were looking for. It was made by an unbiased commercial survey organization.

The survey covered places where, according to the

"Recommended Practices" of the Illuminating Engineering Society, a minimum of 50 ft-candles was required for adequate lighting. In 37% of the places, the lighting intensity was less than 10 ft-c; in 60%, less than 20; and in 86%, less than 45.

Although lighting is as much a production tool as the most complicated machine into which material is fed and from which a product emerges, the Indianapolis survey shows that it does not receive the attention it deserves and must have if American industry is to accomplish the work it has ahead.

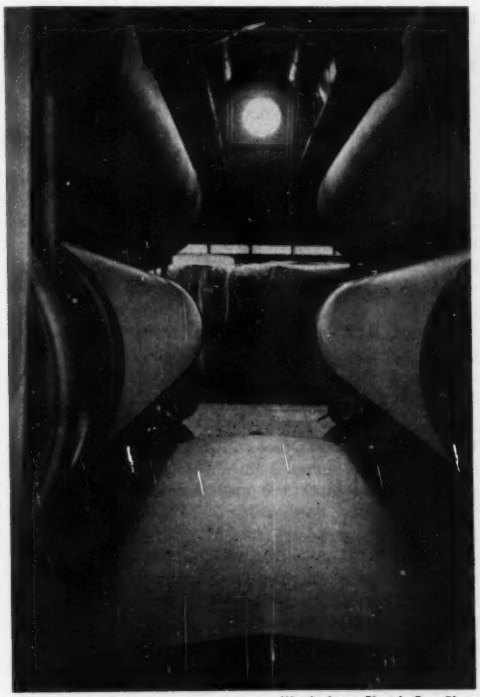
Its Cost Is Low . . . The general poorness of lighting in American industry, while easily understandable for the reasons earlier detailed in this article, has no justification on the basis of cost. In relation to its value, it has the smallest cost of any production component. In the panel on page 118 are shown the average proportional costs of lighting in manufacturing. The data are set up on the basis of 100 sq ft of factory area required for each worker.

The operating cost of 25 foot-candles of lighting per worker per hour is given as 0.41¢. Assuming that cost of lighting is directly proportional to amount of light—which it is not, actually being much less—to double the lighting to 50 foot-candles is to increase total hourly cost of production per worker from $1.6341 to $1.6382, or 0.25%.

Seeing the source of these data—a seller of lighting—the industrial man may conclude he has found a nigger in the woodpile. But has he? Let the cost of lighting be doubled and the increase in cost for going from 25 to 50 foot-candles is still less than 1¢ per hour per 100 sq ft of working area.

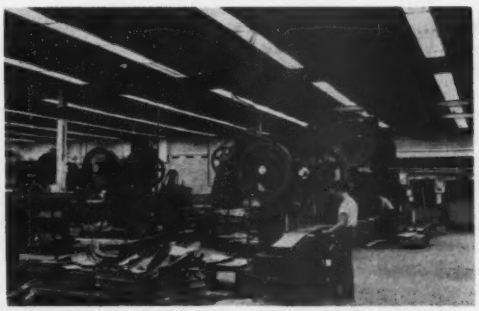
These figures may be challenged on the ground that it is impossible to generalize on lighting or any other element of industrial cost. Costs vary between industry and industry, between plants in the same industry, and between places in the same plant. In process industries, as paper mills, chemical plants, and oil refineries, lighting costs are much lower than in plants where materials are worked on, shaped, and assembled. In paper mills, for instance, analysis of costs puts lighting at less than 0.5% of total investment. In a metal-working plant it may run to 3% or more. In any case, the investment cost of industrial lighting is so small as to affect fixed charges against production in only slight degree. And when it is considered that the proportion of fixed charges in unit product cost declines as production volume rises, any measurable increase in output resulting from improved lighting is bound to pay the cost of that improvement many times over.

As to the operating cost of lighting, that also is so small in relation to labor and material costs as to make it almost negligible. An analysis made some years ago shows labor averaging 22.2%, materials 52%, and light-



Westinghouse Electric Corp Photo

SUPPLEMENTARY LIGHTING between rolls of paper-making machine is provided by 750-watt floodlamps. Stippled lenses reduce glare and diffuse the light from a beam into a cone



General Electric Co Photo

AMPLE HEADROOM allowed 17-ft mounting height. Logical choice here was a large lamp—85 watt—since it required least number of units and thus minimizes maintenance cost

General Electric Co Photo

DISTURBING REFLECTIONS from shiny surfaces of work in this sheet metal shop are reduced by louvres. Rows of 2-lamp, 40-watt units on 11 ft centers, 11 ft high, provide 40 ft-c

General Electric Co Photo

COMPARED TO INCANDESCENT, fluorescent lighting is especially good in composing rooms because of relatively low reflection from type. Continuous rows of 2-lamp, 40-watt units spaced 7 ft 6 in deliver about 65 ft-c on work

Westinghouse Electric Corp Photo

CONVERSION of textile mill space to manufacture curtains required uniform, comfortable lighting. Wireway channels 10 ft apart with 2-lamp 40-watt units spaced on 8 ft centers. Mounting height is 10 ft; maintained illumination 20 ft-c

ing 0.5% in manufacturing operating costs. Since the time when that analysis was made, all costs have risen greatly, that is, all costs except for electricity, which is the largest part of the operating cost of lighting. Therefore, in comparison with labor and materials, lighting is now a lower cost than it has been.

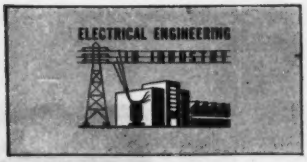
Lighting, a Productive Cost . . . Cost increases in industry may be grouped into two classes, productive and non-productive. By far the greater number of cost increases in recent years and foreseeable ahead must be placed in the non-productive class. Increases in taxes, in wages, in expenses for conformance to government controls, in prices of materials, contribute nothing toward increase of production. But cost increases resulting from additional investment for improvement in plant are productive. Productive also are increases in operating expenses when they result in raising output. The industrialist has practically no say on non-productive cost increases. They are laid upon him by forces and conditions outside of his control. But productive cost increases are entirely in his own hands. It is his choice whether or not to invest in a new machine that has twice the output of an old one. It is his decision whether or not to spend money for improvement of operations.

Because non-productive cost increases have been so large in recent years and probably will continue growing, and because the industrialist can do nothing about them, he must make the most of those cost increases that are in his hands and that result in more production. Paying more for lighting is a productive cost increase that will help to carry the load of the non-productive ones.

Not Good Enough Now . . . Lighting that was good enough when costs were lower has no place in today's conditions. Machines and methods become obsolete; so does lighting. And just as the increased cost of modern machines is justified by increased production, so is the increased cost of modern lighting. What matter if improved lighting can not guarantee any specified amount of production increase? One needs only to look back at the industrial lighting of the past to realize that today's production levels could not have been reached if lighting had not been continuously improved. To know whether or not his plant needs new lighting the industrialist should consider the age of the lighting in it. Is the lighting 20 years old, 10 years, or even only 5? If the answer is "yes," then the productive value of new lighting should be investigated.

Fast Obsolescence . . . The reason is that advances in the art of illumination have made obsolete the best lighting of as little as 5 years ago. This is clearly shown in the "Lighting Mobilization Center" at Nela Park. Here the General Electric lamp department has brought together in one room the facts and factors of modern industrial lighting for demonstration of its values. If it were possible for every factory operator to visit this place and see for himself what lighting means to him, there would be no need for any salesmen to call on him. He would come away with such a realization of the importance of lighting in industrial production that he could not rest until the installation in his plant had been modernized. But all factory operators can't visit Nela Park. It is then the duty of the sellers of lighting to carry the "Lighting Mobilization Center's lessons to them.

Factory Lags Behind Office . . . In general, the lighting of offices and retail stores is far ahead of that of industrial plants. In offices and stores much more attention is pointed to the factors of good seeing. The seeing tasks in the factory may often be more difficult, involving poor contrasts, reflections on polished surfaces, and work in motion, for example. Noisy surroundings, stand-up posture, and hazards of moving machines put more of a strain on the factory worker than on his fellow worker in office or drafting room. Investment per worker and his wage rate average generally higher in the factory than in the office. In view of all this it does not seem reasonable that the quality and quantity of lighting out in the plant should be below what is well accepted as desirable for the office and drafting room.



We Like Our Lighting Mixed

Here's how and why one large industrial plant uses lighting to get a better product and promote good employee morale. The author tells why he prefers mixed high-level general lighting with local lighting. Use of 3-phase branch lighting circuits saved 56% copper and 35% conduit

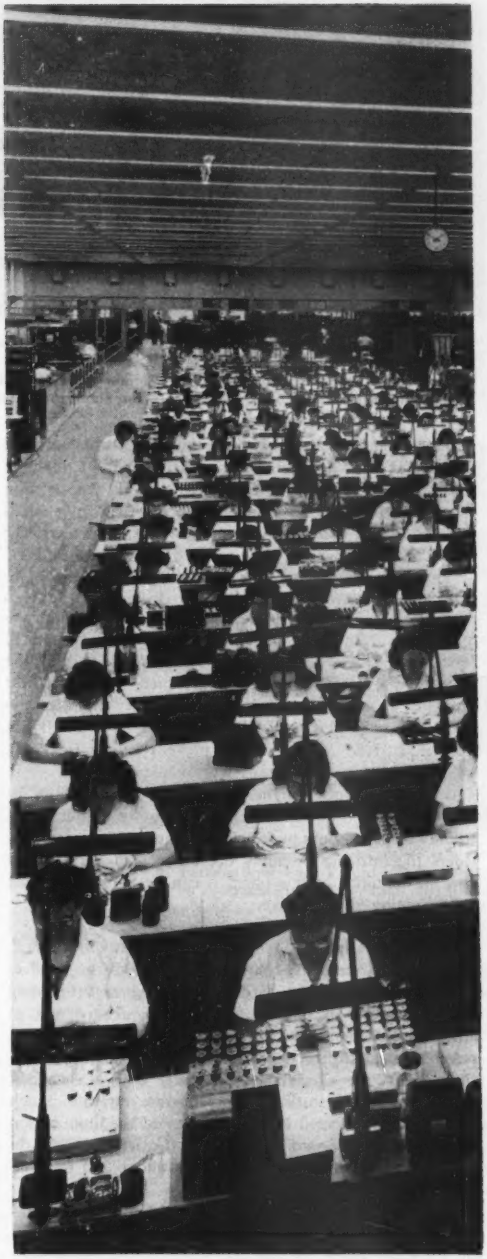
I. M. McNAIR, Electrical Engineer
Western Electric Co, Allentown, Pa.

Glareless high-level general lighting, combined with local lighting designed for difficult seeing tasks, helps us to secure a superior product, efficient work, good employee morale, and maintain good housekeeping at Western Electric's Allentown, Pennsylvania, plant.

We find that 40 ft-c of good general lighting is adequate for many manufacturing jobs. The eye strain normally encountered when using bright local lights in a dim area is prevented with this high level general lighting. The supplementary lighting puts the light just where it is required, takes less power and places less load on the air conditioning system.

The main floor of this plant, which is 325 x 400 ft, is divided into four 100 ft wide sections by three rows of columns spaced 25 ft within the row. Surrounding this area is a 25 ft wide periphery of special rooms which house most of the equipment requiring exhaust. A few items of similar minor equipment are located in the main area but adjacent to a column which allows an exhaust duct to be hidden along the column. There are numerous electric ovens and furnaces and gas burners for glass working machines which produce a large heat load.

High Ceiling . . . This condition led to the use of a high ceiling which, in turn, made it economical to bring services through the floor rather than by long drops from the ceiling. A laminated (packed) wood floor overlaid with maple makes this feasible. As an important by-



FLUSH TROFFER fluorescent lights in acoustical ceiling of main floor provide 45-50 ft-c general illumination and a pleasant working atmosphere. Open continuous troffers are 12 ft apart and have three 40w, T-12 lamps. Baffles prevent lengthwise glare. Each floating arm type bench light has two 15w fluorescent lamps giving 200-250 ft-c on bench

INSIDE CUTS are easily made with the 500 ft-c provided on 3-in. diam circle 18 in. from this gooseneck 6v, cool 15cp auto lamp incandescent unit

TUBULAR TYPE incandescent light gives narrow beam and 1000 ft-c in a 1 in. diam circle for delicate adjustment with the aid of a microscope

MAGNIFIER LENS local unit having three 4-w fluorescent lamps gives 185 ft-c. Some overhead lights are turned off to avoid specular reflections in lens

product, the personnel enjoy the sense of vastness created by the 10 to 15 ft of clear space between the equipment and the 18 ft high acoustical ceiling. This construction also prevents shadows which would produce poor lighting conditions if numerous air ducts and piping services extended to the ceiling.

The entire building is air conditioned. For the main floor, duplex concentric anemostats are located on 25 ft centers. They are flush with the ceiling, accommodate both the supply and return air and are in line with fire sprinklers. These are part of a geometric pattern completed by the deep type recessed lighting troffers which are in east-west rows, 12 ft apart. Each of the 2470 troffer units for the main floor contains three 40-w, T-12 fluorescent lamps and is provided with baffles to prevent lengthwise glare.

These factors combine to create a pleasant atmosphere and to provide ample light with little consciousness of its source. This cardinal requirement of good illumination is usually achieved only by indirect lighting. When one considers the intricate assembly operations and high quality product required of this plant, it can be appreciated that good lighting is imperative.

Initial Illumination . . . When the lighting was first tested, it registered over 65 ft-c and was very uniform. Reflection from the polished hardwood floor gave the ceiling the appearance of indirect illumination. There was so much improvement over the previous plant that it seemed possible to greatly reduce the number of bench and machine lights. It was found, however, that as benches, chairs, and manufacturing equipment were moved in, much less light was reflected from the floor and the illumination at bench level dropped to about 55 ft-c with a slight reduction in uniformity. This includes about 500 to 1000 hr of initial lamp aging.

After nearly 4 years of occupancy, the illumination has leveled off to between 45 and 50 ft-c. Lamp aging is the principal factor of reduced illumination, but a contributing factor is a considerable reduction in reflectance of both the floor and the ceiling. A recent observation made prior to setting up a new manufacturing area showed an illumination of 60 ft-c with a clear floor, a clean ceiling, and elimination of all dead and weak lamps.

Relamping is done on a spot basis, by sections, with the aid of a special platform hoist. Any very weak lamps are also replaced and dust is wiped from the lamps and fixtures. This practice leaves in service a considerable percentage of lamps which are not contributing their full share of light. When lamp failures first occur in a new building, the illumination becomes spotty, but as time passes, old and new lamps become thoroughly interspersed and the spottiness disappears.

Local Lighting Needed . . . While a 45 or 50 ft-c illumination level would seem bright for some factories and is recognized as satisfactory for many others, there are some industries which require considerably higher intensities. The electronics industry is one of them. Even here, however, such jobs as packing, heat treating, glass working, shop office work, etc, can be handled efficiently with a general illumination of 35 to 50 ft-c, or even less. On the other hand, the assembly of vacuum tube components frequently requires a microscope which shades tiny objects from general overhead lights to such an extent that an impractical ceiling brightness would be required. Furthermore, other delicate manufacturing operations require a contrasting bright light that can be restricted to a small work area. Even if the overhead lights provided the same illumination on the work area, the slight shadow cast by the head and body would be objectionable. These considerations led to the use of a moderate intensity of gen-

Comparison of Three-Phase with Single-Phase Branches Shows 56% Savings in Copper—35% in Conduit

	Main Floor Panel 21 Branches		Lower Floor Panel 20 Branches	
	3-Phase	1-Phase	3-Phase	1-Phase
½ in. Conduit, ft	680	140	145	145
¾ in. Conduit, ft	120	300	90	105
1 in. Conduit, ft	0	360	225	435
Total length of conduit, ft	800	800	460	685
Total weight of conduit, lb	713	1075	614	983
No. 14 Wire, ft	2100	400	1240	140
No. 12 Wire, ft	450	2600	1275	1740
No. 10 Wire, ft	0	750	0	1950
Total Wire, all sizes, ft	2550	3750	2515	3830
Total weight of copper, lb	35	80	41	97

TWO TYPES of local fluorescent units are used for winding and inspection of mirror-like fine-pitch grids. Lathe spindle gets 225 ft-c and microscope 290 ft-c

LOCAL FLUORESCENT unit having two 4-w lamps gives 150 to 200 ft-c at welding electrode. Special welding head cuts 47 ft-c general lighting to only 25 ft-c

LOCAL INCANDESCENT inspection unit with 60-w lamp provides 480 ft-c at stems. Glass stresses show up by color streaks not evident under fluorescent light

ENGINEERING DEPARTMENT on second floor has flush fluorescent troffer lights with eggcrate louvers in acoustical ceiling, providing shadowless illumination of 50 ft-c on desks. Each troffer has three 40-w T-12 lamps. Spacing is 6 by 9½ ft

METAL WORKING operations on ground floor get 45 ft-c general illumination at working level from 3 light (40-w) fluorescent units mounted on continuous wiring channel. Additional units can easily be installed. Local lights boost intensity

eral light, plus individual bench lights for operations which require them.

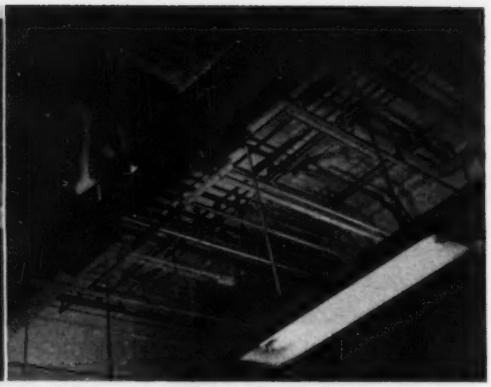
Since the majority of the plant equipment is in small power consuming units, it was decided to gain the safety advantage of the 120/208-v grounded-neutral system and to avoid numerous step-downs which would have been required with a 480-v system. All power is distributed at 120/208-v and it is therefore easy to provide higher light intensities where needed by applying a type of local bench lighting best suited to the job.

Local Fluorescent Units . . . There are three types of local fluorescent lighting employed. The most popular unit for assembly and inspection benches is of the floating-arm type that uses two 15-w lamps and a high power-factor ballast. This gives a wide spread of relatively high intensity light which is suitable for most applications. Where a magnification of two or three diameters is required, a similarly mounted unit with three 4-w lamps concealed behind a magnifier lens is finding increased use. There are a few cases where smaller fluorescents are used because they fit better into a restricted space.

In the incandescent field, two types are generally used. For most piece-part and machine work, a 6-v, 15-cp auto lamp is used in an adjustable focus glass or metal reflector unit. It provides a strong light in a restricted area where contrast is often a requisite to critical seeing. It is not so bulky as the fluorescent and can be set away from moving parts and splashing oil and still deliver light where needed. It has the added safety advantage of cool reflector operation, approaching that of the fluorescent units. The other incandescent unit is smaller and delivers a bright spot of light about an inch in diameter. It finds considerable use with microscopes.

General Lighting Reduced . . . There are two areas where bright general lighting is objectionable. In the glass working area, overhead lighting is reduced for better observa-

LIGHTING LOAD CENTERS having 500-kva dry type transformers supply 120/208v through 225-amp circuit breakers to 24-circuit, 3-phase 4-wire, distribution panels. Load centers simplify distribution and increase flexibility



BUS DUCT, conduit, and piping on ground floor ceiling feed main and ground floor equipment. Maximum pipe and conduit to individual machines are held to shortest possible runs. Services are identified by distinctive color painting of piping

tion of the gas fires and glass reaction. Inspection of glass parts in this area is done under incandescent bench lights, which have proven to be better than fluorescent for this purpose. In another area, the reflections of individual overhead lamps appear on fine-pitch grids which are so closely wound as to look like a mirror. In this case the offending overhead lights are turned off and small fluorescent lights at the side of the microscopes give an intense light on the grid, but the light is directed to avoid reflection into the eyepiece. Both of these cases demonstrate that the background level can be relatively low without causing eyestrain due to excessive contrast. Contrariwise, a slight decrease in work area light below the surrounding light is very disturbing.

Lighting Load Centers . . . Although the upper floor of the plant has a vision strip to make for pleasant conditions, no reliance is placed on daylight. Two load centers having 500-kva indoor air-cooled dry-type transformers serve the lights for both floors of the manufacturing building and of the office building. These are backed up by a battery-operated emergency lighting system which provides for main aisle, stairwell, and exit lights that come on the instant an a-c failure occurs, which is very rare. This same system is also operated on a-c for night lights and holiday lighting. The lighting substations are centered on the lower floor approximately half the building apart and can be operated in parallel over a 1350 amp low-reactance feeder bus duct. They take their power from either of two 12-kv feeder cables and supply 120/208-v Y through 225 amp circuit breakers to the several 24-circuit 100 amp 3-phase, 4-wire distribution panels. In the main plant and office building there are approximately 1374 branch circuits serving 17,500 40-w fluorescent lamps, 200 of various sized incandescent lamps, and a complement of convenience receptacles for office equipment.

Three Phase Circuits . . . Each 15-amp single-pole circuit breaker serves eight three-lamp troffers for the main floor and four to eight fixtures for the lower floor. The circuits are arranged in 3-phase, 4-wire groups to the point of dispersal in the ceiling to obtain minimum losses. In double column panelboard arrangements, this requires grouping three even-numbered or three odd-numbered branches to form a 3-phase group, while single column narrow panels take consecutively numbered circuits.

In some locations the use of the 3-phase branches is discouraged or prohibited because of the ease of overlooking the very necessary detail of assuring balanced phase connections about each neutral. This becomes especially subject to error when two 3-phase groups with two separate neutrals are installed in a single conduit.

System Comparison . . . A comparative analysis has been made of a typical panel distribution area for the main floor of the Allentown plant and for the lower floor. Both the 3-phase system as installed and the equivalent single phase branches are set up for a maximum of 3-v drop from the panel to the farthest light. Since the single phase system carries the full current on each neutral, all except the very short runs will require an increase in the size of wire, which in turn may require larger conduit. Furthermore, as limited by the National Electrical Code, one conduit will accommodate only four 2-wire branches, whereas it may contain two sets of 3-phase circuits for a total of six branches. The results of the analysis are shown in the table on page 122.

With only a small percentage error, the results of the two representative panels can be applied to the entire building. This shows the following total savings for the 22 panels on the main floor and the 27 panels on the lower floor: 32,300 lb of conduit instead of 50,200, or a saving of 35%. For the wire, the three phase system required 1900 lb of copper (not including the insulation) whereas the single phase system would have required 4,400 lb. The saving in this case is 56%. Including the labor and making allowance for slightly higher engineering and inspection costs, it seems conservative to estimate a total savings of at least 25%. In view of the present world conditions, the 56% copper poundage saving demands that designers take full advantage of 3-phase distribution to as near to the last lamp as is practical.

BRIGHTNESS CONTRASTS in inspectors' field of vision are reduced by good general illumination, 30 ft-c. Intensity on the wool cloth is 300 to 500 ft-c. Defective pieces go on to the burler or mender where the same type of illumination is used

BETTER INDUSTRIAL LIGHTING

Textile Mills Need the Best In Lighting

Improved illumination in nylon and rayon weave room estimated to pay for itself in three years

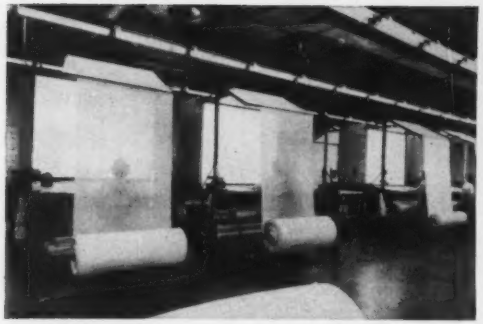
W. T. WATSON, Plant Engineer, Judson Mills, and ROBERT McCLELLAN, Sylvania Electric Products, Inc Greenville, S. C.

Operations requiring close seeing are characteristic of the textile industry, possibly more so than of any other. The yarns used require accurate seeing in the movement of thousands of them through the various machines. Thus it is that improvements in lighting are soon applied in the mills of the more progressive textile producers.

An instance of this is the weave room of the Judson Mills of the Deering-Milliken Co at Greenville, S. C., which was recently relighted on specifications by the authors. Previous lighting was with mercury vapor units that provided an average level of 17 ft-c. These were replaced by continuous rows of 2-lamp fixtures with 8-ft instant-start fluorescents, with 4-ft tubes where the rows crossed air-conditioning ducts. The rows are 7½ ft apart. Mounting height is 13½ ft except for the 4-ft sections under the ducts which are 12 ft above the floor. Average light intensity is 54 ft-c.

Long Tubes . . . A feature of this installation is the use of the 8-ft tube which is not generally accepted practice in the textile industry because of the difficulty of handling. However, the 8-ft tube is more efficient than two 4-ft ones since it eliminates the losses of 2 electrodes. In a very large installation this is important. Another difference is that the lamps are Standard Cool White. Most textile installations use the Daylight lamp. Here again efficiency comes in. The SCW tube, in the 40-watt size for instance, puts out 2200 lumens as against 2,000 for the D tube. Light of the SCW has less blue and is more pleasing.

Humidity No Bother . . . A third feature is the use of instant-start lamps. Humidity in a weave room is kept very high by vapor jets in order to hold the yarn in best working condition. Since high humidity tends to affect adversely the operation of instant-starting lamps, there



INSPECTION of thin nylon and rayon fabrics is done against a luminous panel. With inspection panels on both sides, the enclosure contains twenty-four 40-watt fluorescent lamps

HOSIERY KNITTING MACHINES are lighted by units at a relatively low level to put some 50 ft-c on the operation, but still high enough to provide adequate general illumination

was some question as to how satisfactory they would be. But the tubes used are covered with a hydrophobic coating that holds condensed moisture in a dispersed condition, prevents accumulation of drops of water along the bottom of the tube. During more than 6 months of operation there has been no trouble on this score.

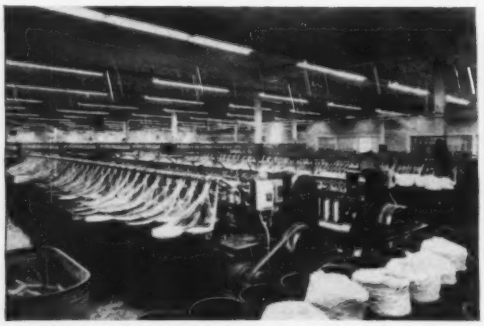
A direct economy effected by the new installation is the elimination of need for portable lamps. Previously a large number of these were necessary for close inspection and "fixing" on the looms. The new lighting, with elimination of shadows and over 3 times the previous intensity, has removed the need for portable lamps of which a large number had been required. This saving is estimated at $1500 per year in this one room. Additional is the saving resulting from improved operations. The total saving is expected to pay for the new installation—all equipment and labor—in 3 years.

The picture at the head of this article shows the new installation in the Judson Mill weave room. The others are of modern lighting in 4 other textile production operations—hosiery knitting, spinning and roving, and inspection of wool and thin synthetic fabrics.

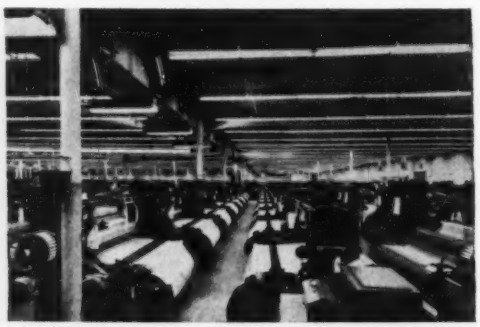
Close Seeing Needed . . . Knitting of present-day sheer hosiery presents a severe seeing task. The yarn is extremely fine and the needles correspondingly small. Therefore a high level of lighting is required along the fronts of the machines. The line source of the fluorescent tube meets this requirement very well. In the knitting room pictured the continuous row units are mounted about 7½ ft high and put an illumination intensity of 50 ft-c on the work.

Detection of broken ends as soon as the break occurs and immediate repair are the primary seeing tasks in spinning. A minimum of 20 ft-c is recommended for this work. In the installation on this page, the intensity is 28 ft-c.

High Intensities . . . The other pictures show methods of inspection for thin and heavy fabrics. Defects watched for include broken threads, knots, loose weaving, slack or tight ends, stretched yarn, and pulled work. Thin fabrics are inspected against luminous panels. Over 2.5 kw of lighting is contained in each of the enclosures pictured, an inspection panel on each side. Inspection of heavy fabrics, such as woolens, presents a different problem. The surface of the cloth is illuminated to very high intensity by fixtures hung at an angle of about 45 deg. When the inspector finds a defect he marks it and continues his work to the end of the piece which then goes to the burler or mender. Here the same kind of specialized inspection lighting is employed.



FAIRLY HIGH LEVEL general illumination (28 ft-c) is adequate for spinning and roving. Brightness is not obtrusive



DEPARTURE FROM GENERAL PRACTICE is the use of instant-start, 8-ft lamps in this weave room

What Rate for Street Lighting?

Rates are not generally compensatory. Analysis indicates procedure for setting up equitable charges. Federal Power Commission data illustrates possible approach by representative utility

H. F. G. MAIN, Rate Engineer, Potomac Electric Power Co

In the rash of rate changes which has broken out in the industry as the result of bringing revenues up to meet increased costs, attention has been focused on the major rate schedules, leaving street lighting rates for the most part unchanged. Now that general rate schedules have been brought nearer into line with costs, and in a good many cases streamlined, it might be well to take stock and see where this street lighting business stands. How far short of meeting costs are the revenues for a service only 37 percent of whose costs are for furnishing electricity, and what, if anything, can be done about it? Which elements of the cost of service are not being met and by how much? Can those costs be reduced or can the revenues for some or all of the deficient elements be increased? Can the rate structures be simplified?

Comparisons Impossible . . . The street light service furnished by most companies consists not only of supplying electricity, but also of furnishing and servicing the circuits and the lights. If the municipality owns a considerable amount of the street lighting property, the company's investment is low but the material and labor for operation and maintenance expense are still a fairly high proportion of the total costs. In some instances only electricity is furnished, the servicing being done under private contract. Under the present Federal Power Commission classification of accounts the revenue in all cases is charged to a single account. Consequently, unfavorable comparisons are made between rates per kilowatt-hour for street lighting and for other commercial service. Comparisons of street lighting rates in different areas are obviously meaningless. Moreover, serious consideration is being given by the National Association of Railroad and Utility Commissioners to the separation of the revenue from this class of service between electricity charge and service charge.

The multiplicity of rates and the complexities of the street lighting rate

TABLE I—Typical Company Cost Data

OPERATING EXPENSES:	
Street Lighting Operation	$100,027
Operation Supervision and Engineering, 15.32%	15,324
Street Lighting Maintenance	178,169
Maintenance Supervision and Engineering, 12.60%	22,449
Subtotal	315,969
Administrative and General Expense, 29.04%	91,757
Total Operating Expenses	**$407,726**
UTILITY PLANT:	
Street Lighting Plant	$3,581,704
General Plant Applicable, 36.95% of Operating Expenses	150,655
Total Utility Plant	**$3,732,359**
FIXED CHARGES:	
Depreciation @ 2.524% of Utility Plant	$94,205
Taxes @ 5.314% of Utility Plant	198,338
Return @ 6.692% of Utility Plant	249,769
Total Fixed Charges	**$542,312**
SUMMARY OF COSTS:	
Operating Expenses	$407,726
Fixed Charges	542,312
Cost of Servicing Street Lights	950,038
Electricity at Standard Commercial Rates 28,698 Mwh @ 1.925¢ per Kwh[1]	552,360
Total Cost	**1,502,398**
Revenue Received from Street Lighting	**1,099,089**
Increase Required to Balance Costs	**$403,317**

[1]By applying the appropriate commercial rate (assuming a 4,000 hour per year burning time) to the street lighting kilowatt-hours of each of the nine companies, the resultant average rate for electricity delivered to the street lighting transformers is 1.925¢ per kilowatt-hour.

TABLE II—Operating Expenses

ALLOCATIONS

	Percent of Total	Allocation of Expense
Transformers and Controls	5	$20,386
Lamp Renewal	15	61,159
Globe Cleaning and Renewal	35	142,704
Other Street Light Expense	40	163,091
Total Street Light Expense	**95**	**387,340**
Traffic Signal Expense	5	20,386
Total Operating Expenses	**100**	**$407,726**

UNIT COSTS

	Amount	Number of Lights	Unit Cost per Light
Transformers and Controls	$20,386	32,237	$0.632

Lamp Renewal:

Size Light Lumens	% of Total	No. of Lights	Weight	Weighted No. of Lights	Amount		
1,000	30	9,671	1	9,671	$9,290	9,671	$0.961
2,500	45	14,507	1½	21,761	20,904	.....	.....
4,000	10	3,224	2½	8,060	7,743	.....	.....
6,000	8	2,579	4	10,316	9,910	.....	.....
10,000	6	1,934	6	11,604	11,147	.....	.....
15,000	1	322	7	2,254	2,165	.....	.....
	70	22,566		53,995	$51,869	22,566	$2.300
	100	32,237		63,666	$61,159		
Globe Cleaning and Renewal					$142,704	22,566	$6.324
Other Street Light Expense					$163,091	32,237	$5.059

The weighting factors for lamp renewal are readily ascertained from cost of lamps and rate of replacement.

TABLE III—Allocation of Fixed Charges

	Street Light Plant		General Plant		
	% of Total	Allocation of Expense	% of Total	Allocation of Expense	Total Fixed Charges
Transformers and Controls	10	$52,042	5	$1,094	$53,136
Lamp Renewal	....	.....	15	3,284	3,284
Globe Cleaning and Renewal	....	.....	35	7,662	7,662
Other Street Light Cost	90	468,380	40	8,756	477,136
Total Street Light Cost	**100**	**$520,422**	**95**	**20,796**	**541,218**
Traffic Signals	....	.....	5	1,094	1,094
Total Fixed Charges	**100**	**$520,422**	**100**	**$21,890**	**$542,312**

UNIT COSTS

	Amount	Number of Lights	Unit Cost per Light
Transformers and Controls	$53,136	32,237	$ 1.648
Lamp Renewal	3,284	32,237	$ 0.102
Globe Cleaning and Renewal	7,662	22,566	$ 0.340
Other Street Lighting Costs	477,136	32,237	$14.801
	$541,218		

TABLE IV—Typical Company Street Lighting Service Charge Rates

	Lights Without Globes	Lights With Globes
OPERATING EXPENSES:		
Lamp Renewal	$0.961	$2.300
Globe Cleaning and Renewal	.....	6.324
Transformers and Controls	0.632	0.632
Other Expense	5.059	5.059
FIXED CHARGES:		
Lamp Renewal	0.102	0.102
Globe Cleaning and Renewal	.....	0.340
Transformers and Controls	1.648	1.648
Other Expense	14.801	14.801
Total Annual Cost	**$23.203**	**$31.206**
Monthly Charge per Light	**$1.86**	**$2.51**

structure are entirely out of proportion to the magnitude of this business. Unlike the general commercial rates, most of them do not lend themselves to ready adjustment for changes in costs of operating and maintaining lights or in the price of fuel.

A study of nine companies, one from each of the nine Federal Power Commission regions, indicates that street lighting rates in general would need an increase of some 37 percent to bring them into line with commercial rates and pay the full cost of servicing the lights.

Who Pays the Bill . . . Most companies seem to agree with the school which holds that it doesn't much matter whether it is the municipality or the other customers who pay the bill, perhaps on the theory that John Q. Public usually ends up paying anyway. There may be something in this philosophy, but John Q. is apt to feel that the City Fathers have a better right than the local utility to decide which of his pockets should contribute to the street lighting bill. Regulatory authorities, too, are showing more and more interest in basing rates on the cost of furnishing the service.

Under a recent rate order, Potomac Electric Power Company is putting into effect a set of rates for street lighting and traffic signal service which reflect, to a large extent, the solution to the problem on its system.

The P.E.P. Co approach may be illustrated by an example representing a typical utility. Using data of the Federal Power Commission, the costs and more desirable rate forms may be worked out for the representative company, the composite of the nine Federal Power Commission regional samples (Table 1).

Rate-Making Components . . . These basic data do nothing more than produce an overall cost per light for servicing and a cost per kilowatt-hour for electricity, whereas most companies have the costs recorded in the standard classified accounts subdivided by operating functions. By making a few reasonable assumptions, however, the typical company basic data may be subdivided into four suitable rate-making components for illustrative purposes (Tables 2 and 3).

Costs incident to transformers and their devices normally are a function of the energy consumption, since transformers are rated in kva, and are additive to the cost of electricity. These costs are small, however, and may be included in the service charge as a matter of expediency.

Material costs for lamp renewals vary with the size of lamp and rate of replacement. The renewals are usually made during the course of routine patrolling, so that the labor of actual replacement is unknown and negligible.

The cost of cleaning and renewing globes is not apt to vary much, regardless of lamp size. An allocation of such costs in proportion to the number of lights is sufficiently accurate. Usually, however, the smaller sizes of lights use radial wave reflectors without globes, so that the globe cleaning and renewal costs should not be assessed against such lights.

The remaining costs incident to the operation and maintenance of circuits and fixtures are somewhat of a hodge-podge, but will generally be found to average out equitably if allocated in proportion to the number of lights. For instance, the reduced cost of shorter series circuits used for the larger sizes is offset by their higher cost per circuit foot due to customary location in congested areas.

In the allocation tables 5 per cent of the totals is deducted for such traffic signal costs as may be in them. The proportions of the totals for the various components are assumed but are accurate enough for illustrative

TABLE V—Deficiency Assignments

	Full "Cost"	Deficiency	Costs Equal To Revenue
Electricity 28,598 Mwh @ 1.925¢ Kwh	$592,360	.....	$552,360
Operating Expenses	407,796	.....	407,796
Fixed Charges:			
Depreciation	94,205	.....	94,205
Taxes	198,338	$178,513	19,825
Return	249,769	224,804	24,965
Total	**$1,502,398**	**$403,317**	**$1,099,081**

purposes. By making similar assumptions as to the distribution of the various size lamps, unit costs may be determined for both operating expenses and fixed charges.

Costs for transformers and controls may be divided by megawatt-hours and the resultant rates per kilowatt-hour added to the electricity charge.

Separate costs were worked out for 600 and 1,000 lumen lamps. The difference of only two cents found between small, monthly costs of the two sizes does not justify a separate charge.

Appropriate combinations of the unit costs may now be assembled into a simple yet reasonably equitable set of rates (Table 4).

The result is a simple form of rate, the principal components of which may be kept under frequent review and readily adjusted to meet changing conditions. If the commercial schedules contain a fuel adjustment, it can readily be carried over into the street lighting electricity charge.

Assigning the Deficiency . . . Where it is not expedient to secure increases in the overall street lighting revenue, this form of rate serves to indicate where the deficiency ought to be assigned. It is certainly reasonable to assume that the revenues first be allocated to the out-of-pocket expenses and any deficiency or "discount" applied to the components representing joint costs, profits, and the like.

In the present instance, for example, the $403,317 deficiency might reasonably be divided pro-rata between return and taxes (Table 5).

The allocated deficiency can then be carried through into the unit costs, and the rates compiled in the same manner as in the full cost example.

Eventually, perhaps, the revenue from servicing street lights may be officially removed from the classification of Revenue from Sale of Electric Energy. In the meantime the two-part rate will facilitate keeping street light rates in line with those of other buyer classes.

With the principal components of cost set out as part of the makeup of the rate and kept under frequent review, comparisons may be made to spotlight any costs which may be reduced without detriment to the service furnished.

Potomac Electric Power Company
Street Lighting Rates in the District of Columbia
Effective April 20, 1951

Street Lighting Rate Schedule "SL"

RATE FOR MONTHLY CONSUMPTION—Electricity supplied for:
Series Lighting, delivered to series lighting transformers.....1.25¢ per kwh
Multiple Lighting, delivered to lamps.....1.03¢ per kwh

ADJUSTMENT FOR CHANGES IN THE COST OF FUEL — The energy charge will be increased or decreased .0014 cents per kilowatt-hour for each one-tenth cent increase or decrease above or below 32.2 cents per million BTU in average cost of fuel as burned in the Company's power plants and charged to its Fuel Expense Account No. 703. This adjustment will be based upon the average cost of fuel during the second month preceding that of the billing month.

MEASUREMENT OF ELECTRICITY—Electricity delivered for street lighting is unmetered. Monthly kilowatt-hour consumptions will be computed on the basis of manufacturers' wattage ratings of installed lamps and scheduled hours of burning time.

Charges for Furnishing and Servicing Street Lighting and Traffic Signal Equipment

CHARACTER OF SERVICE—Operation and maintenance services will comprise testing of lights, lamp replacement, replacement and cleaning of globes and lenses (except fire alarm designation globes), painting of posts, fixtures, and signals and maintenance of wires, cables, fixtures, and related electrical equipment.

Posts, brackets, and luminaires served from the company's underground system are to be supplied by the customer except in case of special installations where the company may agree to furnish them. Equipment used to supply street lighting from the company's overhead system will be furnished by the company.

All traffic signal equipment beyond the point of supply of current will be furnished by the customer and installed by the company at the expense of the customer.

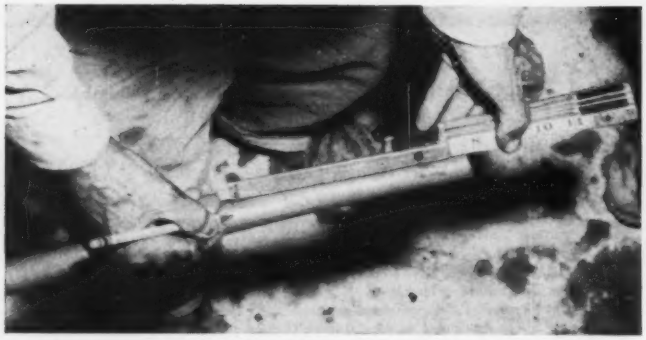
MONTHLY CHARGES—STREET LIGHTING

Equipment served from overhead circuits:

Series Incandescent Lights:	
Without Globe	$0.67 per lamp
With Globe	1.02 per lamp
Sodium Vapor Lights	2.00 per lamp
Multiple—24 hour Fire Alarm Lights, 23 watts	0.54 per lamp
Additional charge for attachments to poles owned by another utility	0.12 per attachment

Equipment served from underground circuits:

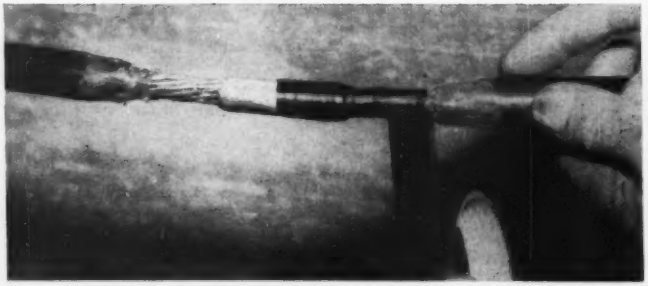
Series Incandescent Lights:	
Without Globe	1.44 per lamp
With Globe	2.13 per lamp
Multiple—24 hour lights:	
Mercury Vapor	2.29 per lamp
200 Watts	0.79 per lamp
Additional charge for supporting posts or brackets furnished by the company:	
Posts or Brackets costing:	
$15.00 and less	0.03 each
$15.01 to $45.00 inclusive	0.04 each
$45.01 to $75.00 inclusive	0.10 each
$75.01 to $100.00 inclusive	0.16 each
$100.01 to $160.00 inclusive	0.30 each



1 MEASURE OUTER JACKET for 7½ in. back from end of each cable forming splice. Strip off outer jacket. Unwind copper shielding tape back to the edge of the cut vinylite protective jacket and cut off all but about 3 in. Remove carbon black paper and 2 in. polyethylene insulation

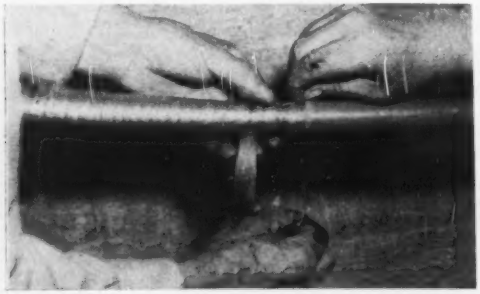
2 TAPER ENDS of insulation and jacket with knife and coarse file. Place friction tape around jacket 2 in. back from tapered edge to mark end

Attention to Details Pays Off in Polyethylene Cable Installation

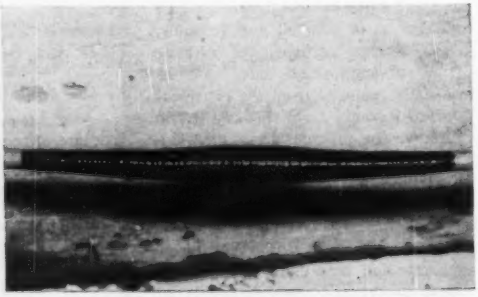


5 TAPE JOINT with layers of non-adhesive polyethylene tape is ¾ laps to build both ends of splice up into conical shape. Pull all tape tight to exclude the possibility of air or moisture being trapped between the layers of tape

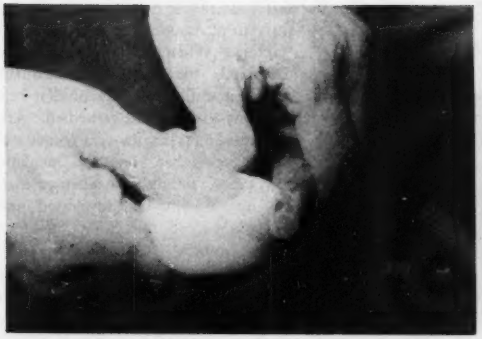
6 WRAP SPLICE with copper shielding braid. Note shielding tape of cable is secured beneath same



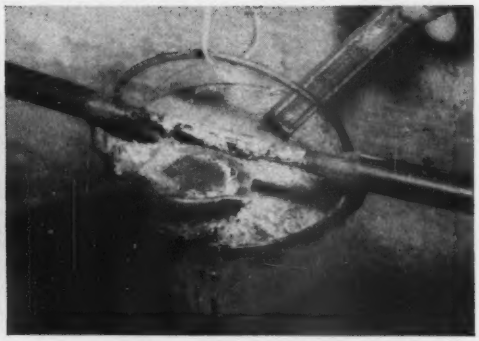
7 TIE ENDS of shielding braid in place with #30 gauge copper wire. Do not attempt to make soldered connection between copper shielding tape and shielding braid



8 TAPE ENTIRE JOINT with two layers of Vinylite tape, ¾ lapped. Be sure to carry out taping to the end markers previously put on the jacket with friction tape



3 **TIN THOROUGHLY** both exposed ends of conductors using stearine cake as a flux. Butt ends tightly into split sleeve. Cable shown is 300,000 CM with 15-kv polyethylene insulation, copper shielding tape and vinyl outer jacket



4 **SOLDER** split copper sleeve of correct size to tightly butted ends of cables. Close slot in connector with acetylene torch while joint is still hot. Wipe off excess solder with a cloth before the solder solidifies too much

Here is the technique employed at one large chemical plant for installing and splicing 15-kv polyethylene insulated cable. With proper attention to details this type cable can be satisfactorily installed at no greater cost than cables having other types of insulation

P. N. LUBKE, Electrical Engineer, Ford, Bacon & Davis, Inc, New York, N. Y.

In expanding the plant of Carbide and Carbon Chemicals Division of Union Carbide and Carbon Corporation at Institute, West Virginia, considerable underground distribution at various voltages ranging up to 13,800-v was required. Their engineering department decided to use cable insulated with polyethylene for all underground main cables.

Since polyethylene has very low dielectric loss and moisture absorption factor, it is an excellent material for cable insulation, especially when placed underground. An outer jacket of Vinylite, another plastic, is used as a protector against damage from abrasion.

A comparison of 15,000-v polyethylene insulated cable with other types in common use today shows in general, that its weight and insulation thickness is less, and costs are very comparable.

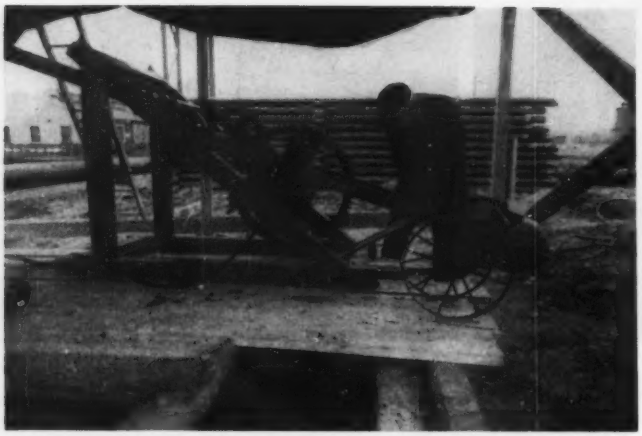
Since the 15,000-v insulated cable embodied all the installation steps of the lower voltage rated cables plus some other operations not required on the latter, this discussion is limited to the higher voltage rated cables.

The cable used was specified to be supplied with 15-kv insulation for operation at 13.8 kv, grounded neutral, with a layer of carbon black impregnated paper and 0.175 in. of polyethylene insulation over the stranded conductor. Over the polyethylene insulation was to be provided a 5 mil soft copper shielding tape intercalated with carbon black impregnated paper

This article was adapted from a paper presented at a recent AIEE Meeting.

9 **APPLY DOUBLE LAYER** of standard friction tape as a final taping over the Vinylite tape to hold it in place. Be sure that tape is pulled tightly to exclude moisture

10 **PAINT JOINT** with at least two coats of insulating compound and allow to dry completely for several days. Test insulation. Tie conductors with tape and twine



11 CABLE PULLING with steel cable winding up on electric "mule" driven winch mounted over cable pit with speed geared to low ratio. Once started, winch never stopped until pull was completed assuring an easy steady pull

and 5/64 in. of non-contaminating Vinylite for outer protective jacket.

The cable was pulled through 4 in. fibre ducts set in concrete and through concrete cable pits spaced at not over 300 ft apart in strategic locations. The duct was very carefully installed in banks rigidly anchored in place and all joints at couplings well compounded so that the seepage into the duct through the joints was held to a bare minimum.

It was quickly learned that little data was available on the proper method of handling, installing, splicing, and connecting cable insulated with this material. Therefore it was necessary to develop our own technique, based on general good workmanship practice for other types of cable, as illustrated by the accompanying pictures made from actual field photographs.

Prior to splicing or terminating any cables, each individual length was tested with a 2500-v insulation tester; a reading close to infinity was necessary to pronounce the insulation satisfactory. When a lower reading was obtained, the cable was carefully checked until the cause of that reading was located and remedied. After the individual lengths of a feeder were spliced together, another insulation resistance reading was taken to ascertain that no flaw had developed in the process before the cable was terminated onto the busses at each end.

Splices in the cable pits were made on days reasonably free of rain and no splice was started that could not be finished that day so that the danger of moisture getting into the cable was held to a minimum. Whenever the appearance of rain during the course of a splicing period seemed imminent, a portable covering over the pit was used as a protector.

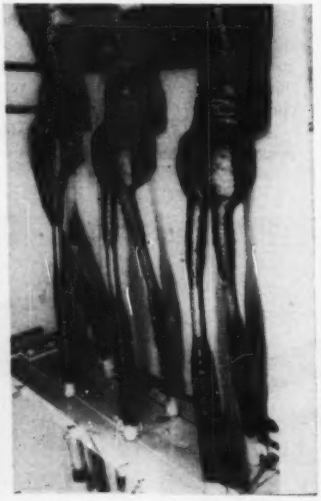
When the cable was ordered, a quantity of splicing and termination kits differing slightly in content from each other were ordered. Thus the mechanic had available all materials needed to make a complete splice. A typical splice kit contained stearine flux, a split copper sleeve, #30 bare copper wire, non-adhesive polyethylene tape, Vinylite tape, friction tape, copper mesh tape, a small bar of solder, and a can of insulating paint.

The shielding tape was permanently grounded at all terminations and at every other cable pit so that the longest possible distance between ground connections did not exceed 600 ft.

When the shield was to be tied to an outside ground connection, an extension of the shielding braid was brought out through the subsequent layers of tape, a connector attached to the braid and to a bare copper wire which in turn was securely attached to a 1 in. ground rod 20 ft long, driven through the floor of the cable pit to permanent moisture. A rod of this length was necessary because of soil conditions.

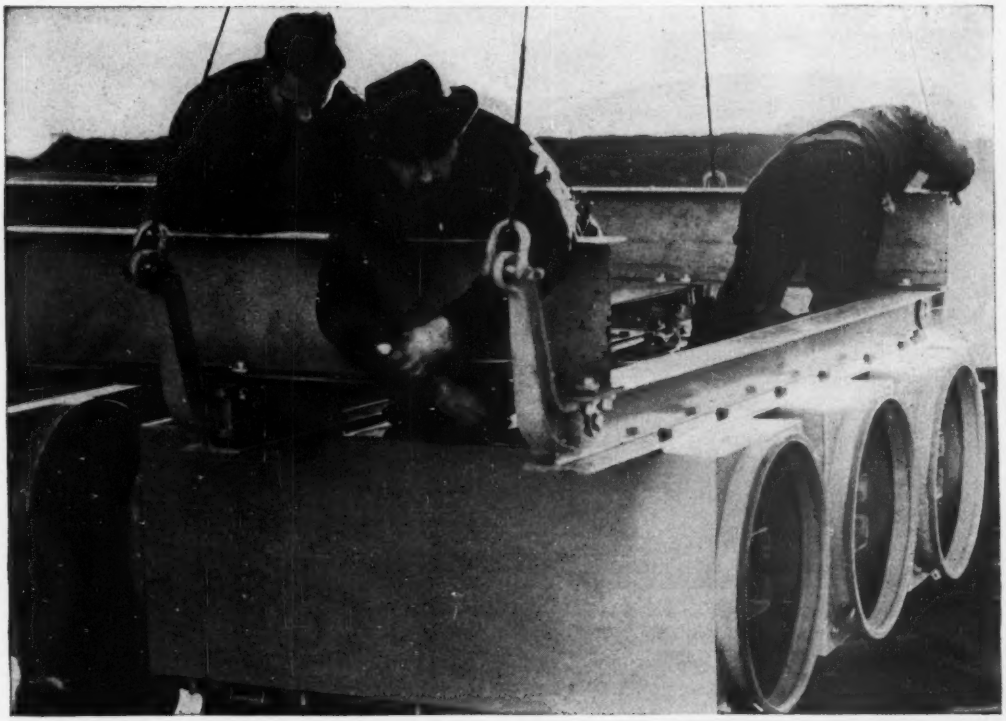
The operation for a cable termination in either the rear of the metal-clad switchgear of the terminal chambers of the transformers was very similar to that described for a splice. The sizes of the transformer terminal chambers were such that only a limited amount of the protective jacket could be removed. However in the switchgear there was ample room to permit making termination 18 in. long.

12 CABLE REELS arranged for even feeding to ducts. Lubricant was powdered soapstone moistened with water. There was no injury to cables



13 CABLE TERMINATION operation on switchgear cubicles consists of sealing off cable at vinylite jacket end and at terminal lug end

Remove crate . . . Lift into place



ISOLATED-PHASE BUS SECTIONS shipped assembled, ready to install

Factory-assembled G-E isolated-phase bus sections pay off in low installation costs. Crated three-phase sections arrive ready to lift into place. You simply knock sides off crate—apply lifting brackets to "H" mounting beams and hoist into position for permanent bolting. When bus connections are made with semi-flexible connectors and sectional joints are sealed with gasketed banding rings—the job is complete!

Other advantages of G-E design include high insulation values—reduced number of creepage surfaces without sacrifice of mechanical strength—dust and water-tight hinged covers which open from either side for easy inspection.

Your G-E sales representative has complete information. Ask him for a copy of GEA-5460, a 28-page publication that will aid you in planning your buses, or write to General Electric, Schenectady 5, N.Y.

Semi-flexible connectors join copper buses of adjacent sections. This provides quick and easy alignment between sections. Split gasketed aluminum banding rings seal out dust and water, reduce maintenance.

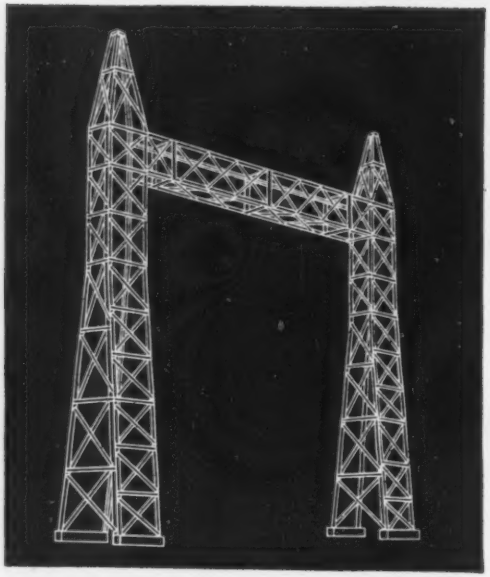
855-29

GENERAL ELECTRIC

Now.. G-E Outdoor Stations

with Standardized Structures

Available in voltage ratings from 7.5 to 230 kv

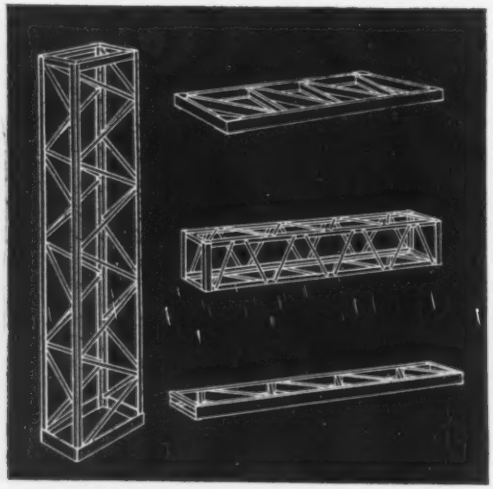


HIGH TOWER—Used for dead-ending incoming lines as well as support for incoming line disconnects. Lower truss supplied when required for support of oil circuit breaker isolating switches. Tower can be used singly or combined to make multi-bay arrangements.

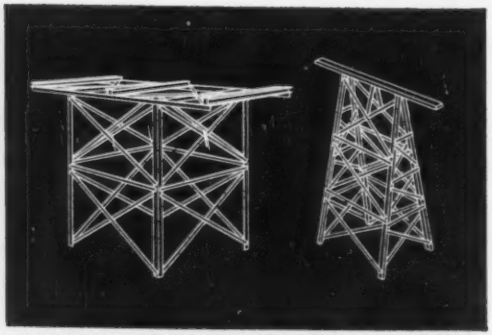
Designed as a result of 35 years of experience in outdoor station construction, G-E standardized steel structures now mean lower installed costs, less time required for station layout and engineering.

The typical components shown on this page can be combined to form an infinite variety of station arrangements. The design of all the electrical and structural items in an outdoor station must be co-ordinated mechanically and electrically if the items are to form a satisfactory installation. Sensible standardization of structural steelwork now makes it all the more practical to order it as one pre-designed component along with the other station equipment.

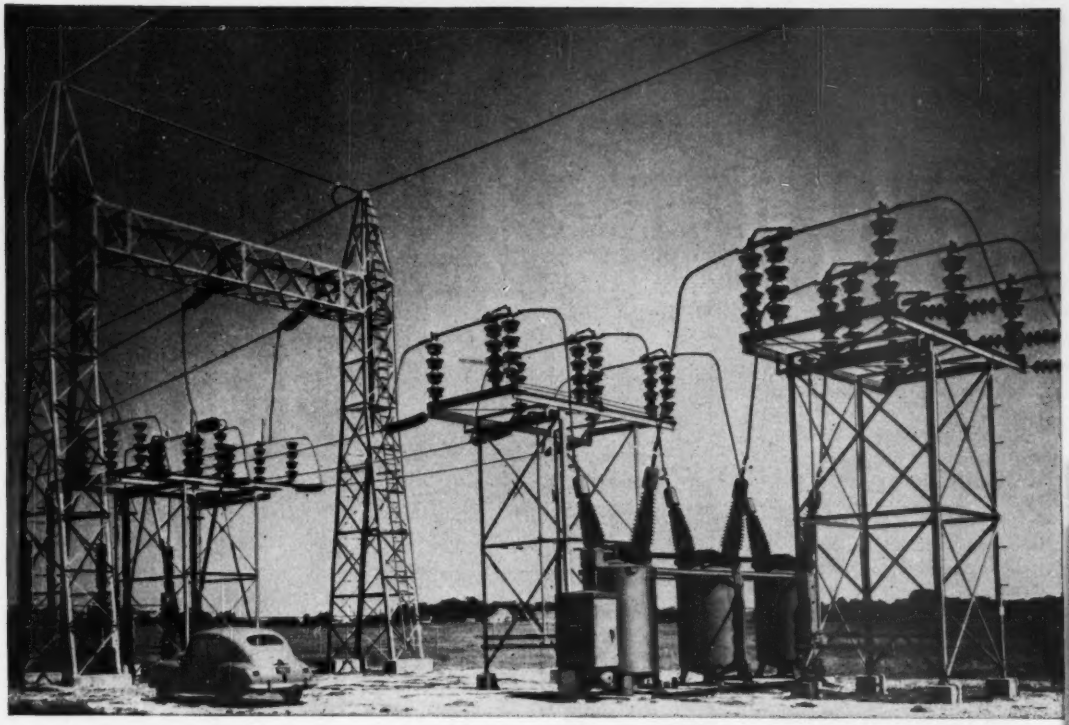
Development of these structures was a logical step in the trend towards increased standardization as a means of achieving maximum savings of time and money.



COLUMNS AND TRUSSES—Square or rectangular columns in lengths of 13'6" through 38'. Together with flat and box-type trusses, they form easily assembled "building blocks" for a wide variety of structures for mounting switches, fuses, lightning arresters, buswork, current transformers and other equipment.



SWITCH AND DEAD-END TOWERS—These towers are available in standardized dimensions to suit various voltage ratings. Design is based on a long experience with similar structures and requirements expressed by a long list of users. Other equipment available includes insulator pedestals and equipment stands.



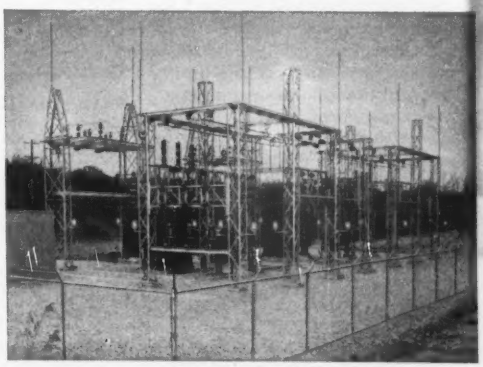
161-KV STATION showing use of standardized switch towers and high tower with one horizontal truss. This station was erected by the St. Joseph Light and Power Co., Marysville, Mo., one of the many users of G-E standardized outdoor stations.

Complete stations in standardized, pre-designed units—adaptable to every type of layout

The two outdoor stations shown here are typical examples of "building block" construction using G-E standardized structures, together with G-E switchgear, transformers and other equipment.

By ordering complete G-E outdoor stations with pre-designed, standardized structures, the tedious job of engineering and detailing separately ordered items is avoided. There is only one specification, one purchase transaction for each station. And with less time lost on detailed structural engineering, personnel can give more attention to the more important work of long range system planning.

For details of G-E standardized structures, write for Bulletin GEA-5573. For other information to help in outdoor station planning, ask for GEA-1040—Power Transformers, GEA-4985, 1642 and 4407—Oil Circuit Breakers, GEA-4980—RF Disconnecting Switches, and GEA-1304—Thyrite Lightning Arresters. *General Electric Co., Schenectady 5, New York.*



CINCINNATI GAS & ELECTRIC CO. MIDWAY STATION constructed entirely of G-E standardized structural units including latticed columns and trusses. Use of these components saved time and expense in designing, and expedited erection.

GENERAL ELECTRIC

853-5

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Separate Bill of Material Saves Time Three Ways

M. K. BROWN
System Supervising Engineer
Niagara Mohawk Power Corp
Buffalo, N. Y.

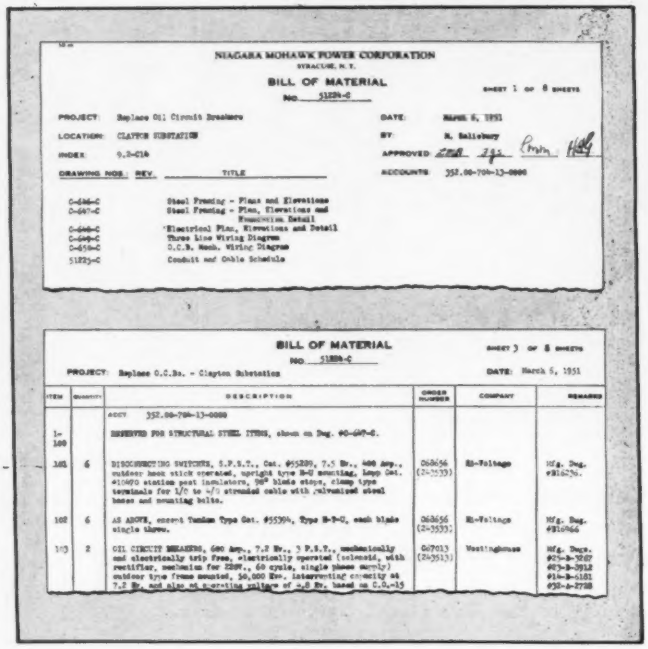
Much time is saved and inconvenience eliminated by use of separate, typed bills of materials for substation and transmission line construction on the Niagara Mohawk Power Corp system. In the past, the design engineer or draftsman had to accurately and laboriously letter-in the bill of material on the working drawing. Using the separate bill scheme, the engineer merely lists the materials needed and has them typed on a standard form. Thus his time is released for actual engineering design.

Standard Forms Are Convenient

In ordering materials for the project, the construction foreman and storekeeper are not inconvenienced by a bulky, rolled working drawing. Standard 9 x 11-in. forms are easy to carry and convenient to store. For determination of construction costs of the project, only the separate bill of material and storekeeper slips need be sent to the accounting department.

For use in the field, the working drawing has key numbers which refer to items listed in the bill of material. Sheets attached to the bill of material list working drawing or drawings necessary for the project and contain an explanation of the work to be done on the particular project.

When the project is completed, the bill of material is attached to the corresponding drawings and stored as a permanent record.



NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N. Y.

BILL OF MATERIAL
No. 51284-C

PROJECT: Replace Oil Circuit Breakers
LOCATION: CLAYTON SUBSTATION
INDEX: 9.3-C1A
DATE: MARCH 6, 1951
BY: R. Salisbury
APPROVED: [signature]
ACCOUNTS: 352.00-709-13-0000

DRAWING NOS.	REV.	TITLE
D-646-C		Steel Framing - Plans and Elevations
D-647-C		Steel Framing - Plan, Elevations and Foundation Detail
D-648-C		Electrical Plan, Elevations and Detail
D-649-C		Three Line Wiring Diagram
D-650-C		D.C.B. Mech. Wiring Diagram
51225-C		Conduit and Cable Schedule

BILL OF MATERIAL
No. 51284-C
PROJECT: Replace O.C.Bs. - Clayton Substation
DATE: March 6, 1951

ITEM	QUANTITY	DESCRIPTION	ORDER NUMBER	COMPANY	REMARKS
		ACCT. 352.00-709-13-0000			
1-100		RESERVED FOR STRUCTURAL STEEL ITEMS, shown on Dwg. 90-647-C.			
101	6	DISCONNECTING SWITCHES, S.P.S.T., Cat. #55289, 7.5 Kv., 600 Amp., outdoor hook stick operated, upright type B-D mounting, Lapp Cat. #10490 station post insulators, 36" blade steps, clamp type terminals for 1/0 to 4/0 stranded cable with galvanized steel bases and mounting bolts.	068656 (2-35533)	Hi-Voltage	Mfg. Dwg. #816250.
102	6	AS ABOVE, except Tandem Type Cat. #55304, Type B-D-C, each blade single throw.	068656 (2-35533)	Hi-Voltage	Mfg. Dwg. #816844
103	2	OIL CIRCUIT BREAKERS, 600 Amp., 7.2 Kv., 3 P.S.T., mechanically and electrically trip free, electrically operated (solenoid, with rectifier, mechanism for 230V., 60 cycle, single phase supply) outdoor type frame mounted, 50,000 Kva. interrupting capacity at 7.2 Kv. and also at operating voltage of 4.8 Kv. based on C.O.-15	067013 (2-35513)	Westinghouse	Mfg. Dwgs. 825-A-7207 827-A-2912 814-A-6181 830-A-2738

BILL OF MATERIAL typed on standard 9x11-in. sheets eliminates need for hand-lettering items on working drawings. Key numbers provide reference between drawing and bill of material. Not shown is sheet which explains scope of project

Check Carrier Current Equipment With Play Back Unit

An effective and inexpensive method is presented for maintaining closer supervision over the operating conditions of carrier-current equipment in unattended stations. The method is remote testing of carrier-current relay equipment at unattended stations. A prolonged carrier transmission from a testing station causes a remote carrier-current relay equipment to return or "play back" carrier transmission to the test station, if operating.

T. W. DUGDALE
Div. Superv. of System Operation
Indiana & Michigan Electric Co
South Bend, Ind.

For economic reasons, tests of carrier-current relay equipment at remote substations were formerly made on a weekly basis to coincide with other routine inspection trips. However, this plan did not insure continuous carrier-current relay protection. In case a tube should burn out soon after the weekly check had been made, the substation would be without relay protection for the entire week. To overcome this serious possibility a

(*Continued on page* 140)

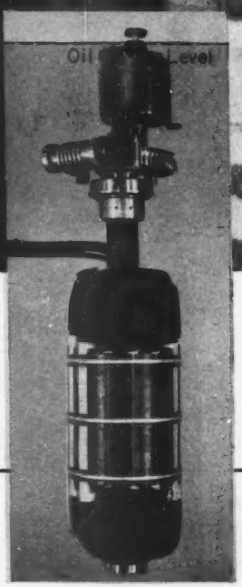
The controls on all station-type feeder voltage regulators now meet rigid ASA Standards for Class I accuracy. This means they have an accuracy of at least 99%.

Induction Voltage Regulators require less maintenance

- No contacts in the main circuit
- No cams or springs or elaborate gear trains
- No mechanical brake to adjust, no separate braking circuit
- Nothing to lubricate—complete operating mechanism (including the motor) immersed in oil
- Even the oil lasts longer—because the tank is sealed to stop all breathing

And remember—G-E induction voltage regulators give accurate, stepless regulation of the highest quality obtainable. Rugged simplicity and the absence of time-delay makes them ideally suited for use on distribution circuits where loads are heavy, voltage variations are frequent, and prompt response to voltage change is essential.

Bulletin GEA-2985 gives full information. A copy can be secured from your G-E Apparatus Sales Office, or by writing *General Electric Company, Schenectady 5, N. Y.*

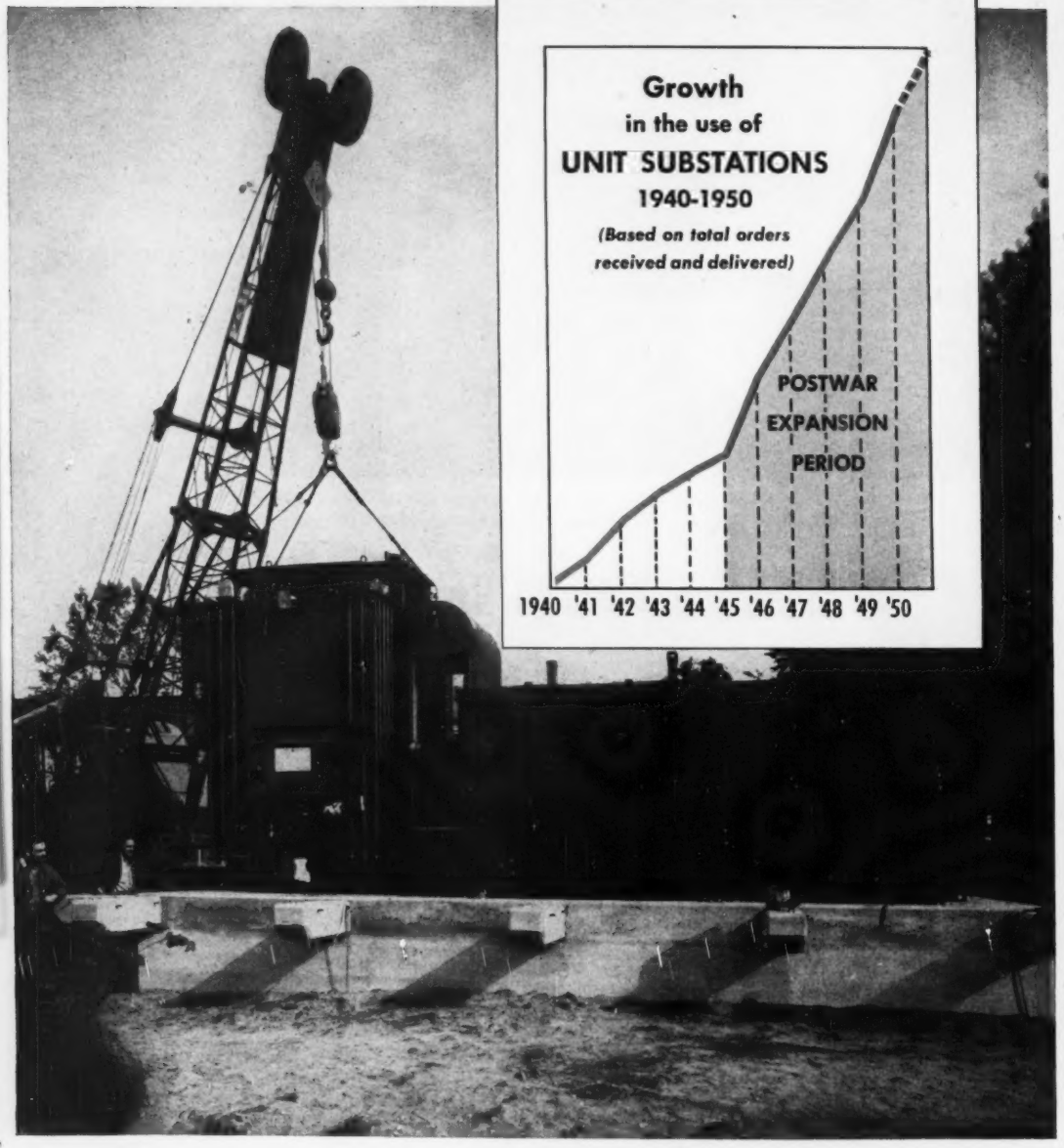


The General Electric IRS Induction Voltage Regulator has only three shafts, including that of the motor. All are mounted on enduring roller or ball bearings; all operate under oil. Wear is negligible. One gear train, a double-worm reduction, provides a drive that is simple, silent, self-locking and positive. There are no ratchets, no pawls, no chains to introduce uncertain operation and questionable life. No special braking circuits are used. The capacitor that gives the motor its high starting torque promptly throttles its rotation when the motor supply circuit is opened.

404-79

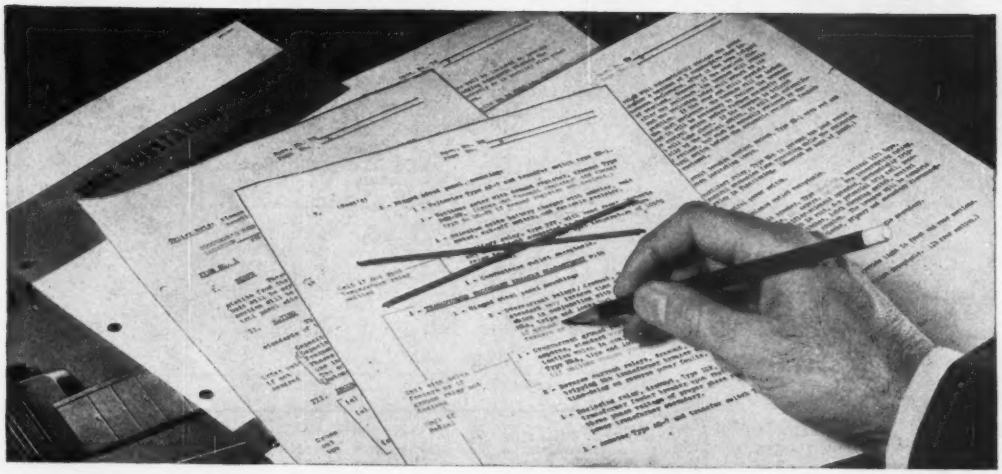
GENERAL ELECTRIC

Unit Substations—Key to



QUICK INSTALLATION: G-E unit substations come to you complete—ready for operation. You merely build the foundations, position the equipment and connect to your incoming and outgoing lines. Photo shows G-E unit substation being installed on the system of the Western Massachusetts Electric Co.

Fast, Low-cost Expansion



WEEKS SAVED IN ORDERING! Basic guide-form specifications for G-E unit substations are available to you, and using these, you merely add ratings and number of circuits required and cross out details not applicable. Weeks are saved in detailing layouts and piecemeal ordering. Your engineers have more time for other system work.

Simplified purchasing, ease of installation help in meeting fast-growing loads . . .

The rapid trend to factory-assembled unit substations—as shown in the chart at the left—seems sure to accelerate even more tomorrow.

Faced with the fastest-growing loads in history, utilities are finding these standardized, easy-to-install units one of their most valued tools in meeting expanding power demands quickly and at lowest cost.

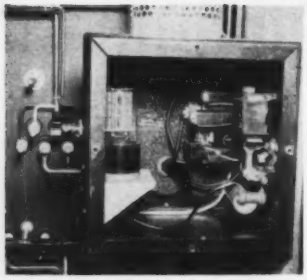
Because of their great flexibility, compactness and adaptability, G-E unit substations are applicable to a wide variety of system arrangements. Standard, co-ordinated designs simplify planning and purchasing.

There's less worry about manpower and material problems. And proved, factory-engineered construction assures outstanding dependability. For full information, write for Bulletins GEA-3800 and GEA-4500. *General Electric Co., Schenectady 5, N. Y.*

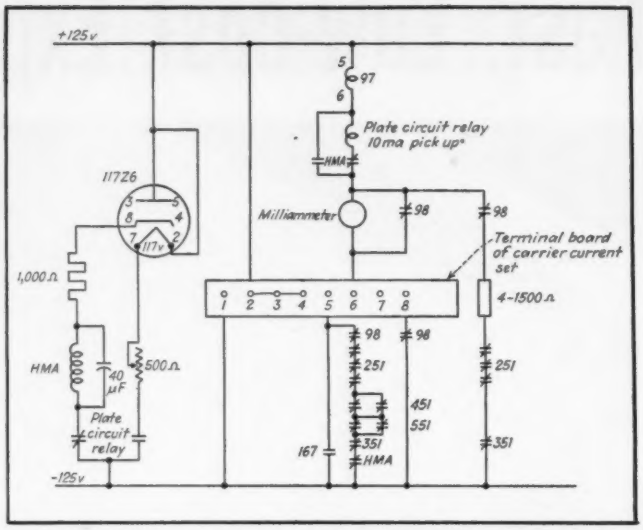
INSTALLED RIGHT AT LOAD: Compact, modern, attractive design of G-E unit substation enables it to be installed close to the load, even in many residential areas. Vital copper for secondary circuits is saved. The substation above was installed by the Western Massachusetts Electric Co. Note church in background.

321-74

GENERAL ELECTRIC



PLAY BACK unit in case with cover removed as installed in substation



CIRCUIT DIAGRAM of play back unit which will receive a 15-sec signal from an attended station and play back a 30-sec signal from an unattended station

play-back unit (illustrated) was developed and connected to the carrier-current equipment at an unattended station.

Operation of the play-back unit is simple. When a push button is depressed at an attended station a signal is transmitted on the carrier-channel for approximately 15 sec. This purposely is a relatively long transmission to prevent the device from coming into operation during normal system faults. The carrier-current signal received at the remote station picks up the plate circuit relay, set at approximately 10 mils to insure sufficient signal margin for normal operation. Heater of the type 117-Z-6 tube is then energized from the front contact of the plate relay. After completion of the prescribed 15 sec transmission, the plate relay drops out opening the heater circuit and its back contact completes the cathode circuit. The resultant plate current picks up a type HMA auxiliary relay to open the screen-grid circuit on the carrier-current relay set and bypass the coil of the plate relay. The 117-Z-6 tube will continue to pass current for approximately 30 sec before it has dissipated sufficient heat to cut-off. This play-back results in a 30-sec carrier transmission from the substation.

In the South Bend Division, play-back units have been installed at seven distant substations. This permits frequent checks of the carrier-current channels emanating from the Twin Branch Plant. Several of these substations have the play-back unit interlocked with station alarm relay so it cannot operate if the alarm relay has picked up. Thus an abnormal condition is indicated to the transmitting attendant by the failure to receive a played-back signal, and an immediate investigation is warranted. Installed cost of this unit is approximately $40.

Protect Thermometers in Water Tunnels

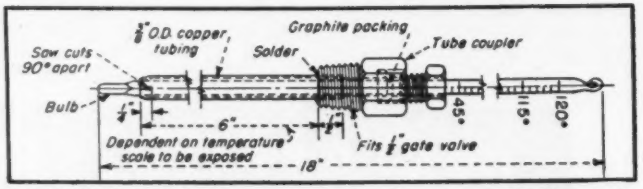
R. D. BRIGGS
and
J. R. KRIER
Test Engineers, Results Dept
The Ohio Power Co
Philo, Ohio

Breakage of high-priced test thermometers due to excessive vibration in condenser tunnels can be prevented through use of a copper protective tube. The tube, made from scrap material at small cost, is easily and quickly installed or removed. These devices are used to protect mercury thermometers which are 18 in. long, have bare bulbs and stems, and have scales from minus 30 F to plus 120 F with 0.2-deg graduations.

Formerly, each thermometer was inserted through a hole in a rubber stopper and then placed in an open gate valve. Turbulence and velocity of the circulating water caused the thermometers to sway and vibrate in the stopper with a high frequency and breakage resulted.

To permit temperature readings, water tunnels are drilled and tapped to receive a ½-in. nipple with a ½-in. gate valve. The improved thermometer mounting fits into the gate valve.

Length of the protective tubing should allow reading of the thermometer regardless of seasonal changes in circulating water temperatures.



THERMOMETER HOLDER with copper protective tube puts an end to thermometer breakage due to vibration induced by circulating water turbulence and velocity

Perhaps we can give YOU a HELPING HAND

● Under present conditions we cannot always give you all the materials you require. But we can give you plenty of help through Revere's Technical Advisory Service. And, our colleagues in American business tell us it's a worthwhile aid, too. We have been rendering this service for many years, and it is backed by a wealth of knowledge accumulated over a century and a half of working with metals.

So, with your problems on the increase, as whose aren't these days, why not check us on what's bothering you and see if we can't help. We are already helping others regarding the usage, to their best advantage, of the products they *can* get.

Since two or more heads can produce more right answers than one, let's get together. You can get in touch with the Revere Technical Advisory Service through the Revere office nearest you.

REVERE 150TH YEAR OF SERVICE IN AMERICA

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

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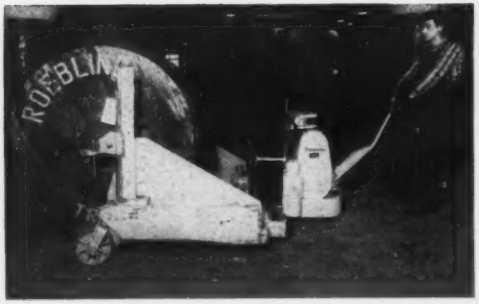
SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Machines Save Labor In Cable Shop



CABLE REELS weighing up to 6,000 lb are lifted and moved efficiently by one man with a battery operated transporter

LOADED SKIDS can be moved with little effort to anywhere in shop by one man with a battery operated transporter

C. F. TWOMEY, Engineer

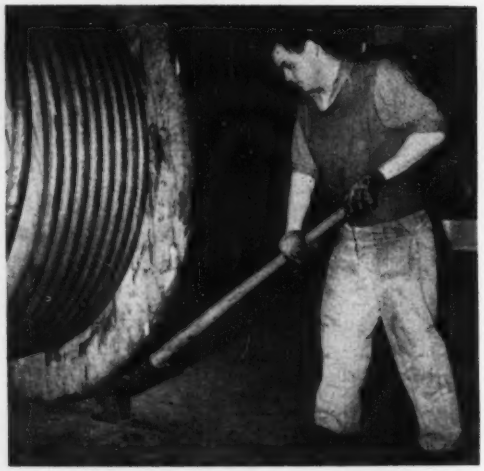
Underground Division, Construction Department
Commonwealth Edison Co, Chicago

Manpower requirements in the cable shop have been materially reduced and the work made easier through maximum use of machines. Described here are some of the machines used by Commonwealth Edison Co and the benefits which are derived through their use.

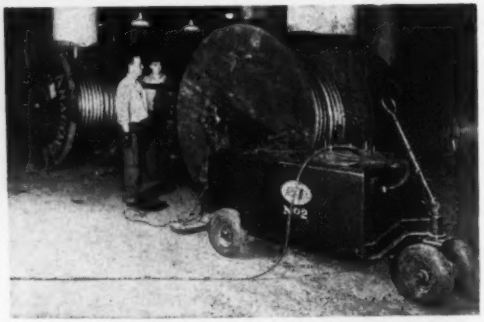
A battery operated reel transporter permits one man to move heavy reels of cable about the shop and into position with minimum time and effort and maximum safety. A somewhat similar battery operated device is used for lifting and moving heavily loaded skids. These two devices have helped to reduce manual labor in the cable shop by a considerable amount.

Cable is transferred from one reel to another with a portable electric-motor-driven reel turner. Junk cable is cut into scrap lengths with a hydraulic cutter. Using a modified "car mover," one man can move a heavy roll of cable without undue strain.

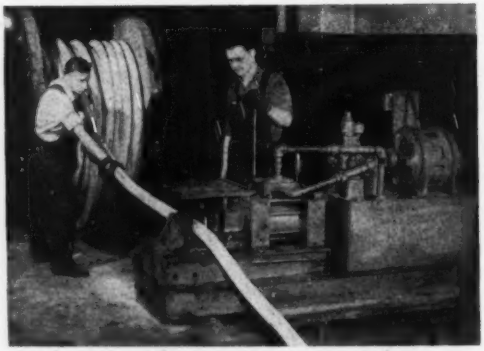
In every application of a machine in the cable shop, the keynote has been to decrease the labor required and to make all work safer.



ONE MAN rolls reel of cable using a modified "car mover." Reels can be moved in this manner without undue strain



TRANSFER OF CABLE is simple task using portable electric-motor-driven turner. Operator controls reel motion with electric foot switch. Machine can be run at several speeds



CUTTING CABLE into 6-ft lengths for scrap with a hydraulic cutter requires two men. Cutting blade is operated by a push-pull handle which quickly closes and opens the blade

"So Easy, even a girl can assemble it"

says Millie Seelhorst,
Pole Star Core Assembler

Miss Mildred Seelhorst, who works on the Pole Star Core Assembly Line, illustrates the ease with which the lapped core can be built into the coils of a Pennsylvania Pole Star Transformer.

The relative simplicity of this operation emphasizes an important feature of the Pole Star core:

In the event a coil is damaged by lightning or excessive overloading, the entire core and coil unit does not have to be scrapped — most of it can be used again, because the core can be taken apart and quickly rebuilt with replacement coils *without appreciably affecting the low core loss or exciting current of the Pole Star.*

This functional design feature of the Pole Star Core assumes added significance during the present period of national emergency, when it is necessary to conserve copper and steel wherever possible.

Pole Star Transformers are available in sizes 3 KVA through 100 KVA, 2400 through 14,400 Volts.

Laminations from center of core are inserted into the coils, brought through, and individually lapped. No special tools are needed, and the annealed steel is not bent beyond its elastic limits.

Each individual lamination forms its own magnetic path — is actually a core itself. Since there are no gaps or butt joints in the core, no mechanical clamping device is required to hold the core together.

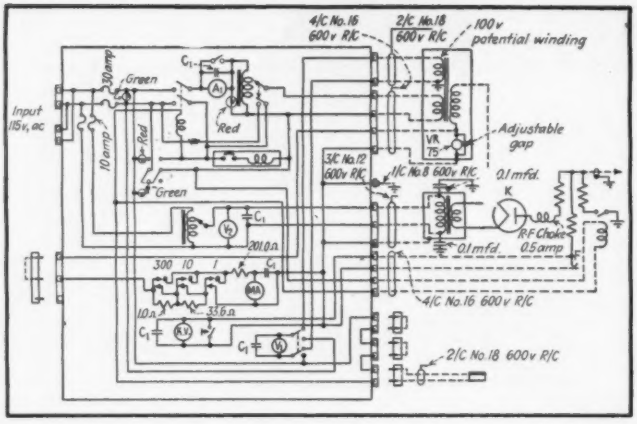
The last lamination is taped, then brazed, and the unit is complete. The amount of contact pressure between laminations is not important; therefore the noise level in the core will be at a low level and will not change.

P.S. Let the POLE STAR be your guide

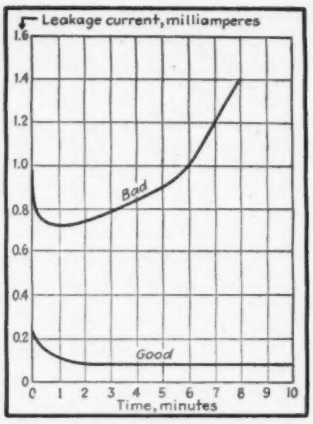
Product Of Long Experience
Safe Thrifty And Reliable

Pennsylvania TRANSFORMER COMPANY

Canonsburg, Pennsylvania - Greater Pittsburgh District



CABLE TESTER consists of basic half-wave rectifier made up with a KC-4 Kenetron tube, a 5-kva, 115/230—50,000-v plate transformer, a filament transformer, and a control unit. Equipment operates from any 115-v supply of 2-kva or more



LEAKAGE CURRENT shows condition of cable within 2 min. Good operator can detect fault without actual breakdown

Compact Dc Cable Tester Reduces Service Failures

J. A. LASSETER
Distribution Engineer
Florida Power & Light Co
Miami, Florida

This compact high voltage dc cable testing rig is suitable for field use. Its output of 70 kv has been proven effective for cables rated up to 33 kv. Many cases of service failures have been avoided by its use.

Experience with making periodic leakage current tests of important cables at 60% of Insulated Power Cable Engineers Assn factory test voltages has indicated that dc tests are not detrimental to serviceable cable. The significant factor in test results has been found to be comparative leakage current values and not necessarily the ability of the cable to successfully withstand the test voltage. An increase in leakage current since prior test or unbalanced leakage currents on three phases in the same run often indicate incipient faults.

Basically the test set is a half wave rectifier made up with a KC-4 Kenotron tube, a 5-kva, 115/230-50,000-v "plate" transformer, a filament heating transformer, and a control unit. The components are connected so that dc output is negative with respect to ground.

The control unit contains variable auto-transformers to control the filament and output voltages; meters necessary to measure input and output voltages and currents; and a pilot control circuit that includes features to protect operating personnel. All connections from the control unit to other components are made with twist-lock plugs of different sizes and varying number of poles to prevent mistakes in connecting equipment.

Maximum output voltage is 70 kv dc. It is measured directly by a 1000 megohm oil-filled shielded resistor in series with a microammeter calibrated directly in kilovolts.

Output current is read with a multi-range milliammeter connected in the ground side of the high winding with a low range of 0-1 ma. Maximum current output is 300 ma.

FIELD TESTING of cable is facilitated by use of truck to carry test set. Little round box (arrow) is safety foot switch for observer. Fully shielded, co-axial RG/8U test lead is brought out of truck through protected hole in window

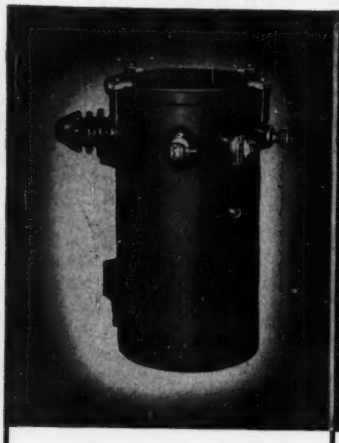
Two 25-kv, 1-μf capacitors and a sphere gap are included to locate faults by the condenser discharge method.

This equipment was assembled and installed by Florida Power & Light Co in a panel truck with windows in the side panels. This type of truck was selected so that the operator would have good vision in all directions for safety reasons. Normally, all tests are made from within the truck and set up for tests at inaccessible locations. The installed cost of the equipment, exclusive of the truck, was approximately $2,000.

During 22 months of operation, 1,100 cables were tested and 182 faults were located. Sixty-five of these faults were detected and located during installation test; 31 were located following service failures and 86 were detected and located during periodic tests.

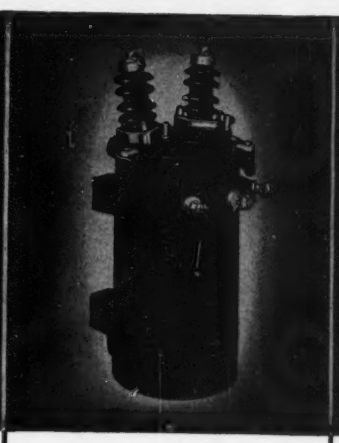
MOLONEY DISTRIBUTION TRANSFORMERS

...for *DEPENDABILITY and PERFORMANCE*



CONVENTIONAL TYPE LL

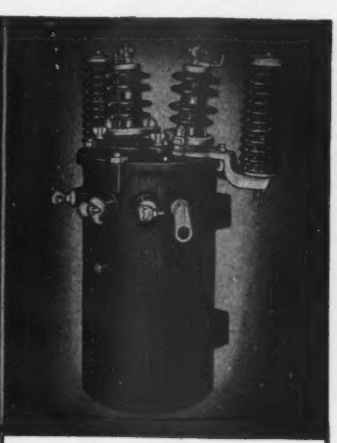
The Type LL Transformer is provided with sidewall-mounted high voltage and low voltage bushings for use on system voltages of 5000 volts or below. These transformers are manufactured in standard Kva ratings from 3 to 100 Kva. Porcelain protective caps are regularly supplied on the high voltage terminals of Type LL Transformers to protect the lineman from accidental contact with the live terminals.



CONVENTIONAL TYPE CL-2

The Type CL-2 Transformer is provided with two cover-mounted high voltage bushings. These transformers are standard in sizes 167 to 500 Kva in all voltages and in sizes 3 to 500 Kva in voltages above 5000 volts.

Transformers with a single cover-mounted high voltage bushing, designated as Type CL-1, are designed for use on grounded neutral systems. One end of the high voltage winding on this type transformer is grounded to the tank internally.



COMPLETELY SELF-PROTECTED

Completely Self-Protected Transformers are equipped with lightning arresters, internal protective links, tank grounding gaps, and secondary circuit breakers. These transformers are available in standard ratings up to 100 Kva and voltages up to 15000 volts. High voltage bushings are sidewall-mounted for voltages of 5000 volts and below and are cover-mounted for voltages above 5000 volts.

The Moloney Electric Company has a transformer to meet the requirements of any distribution system. Recognition of the fact that continuity of service is a "must" on these systems has always been a guide to Moloney engineers in the design of distribution transformers.

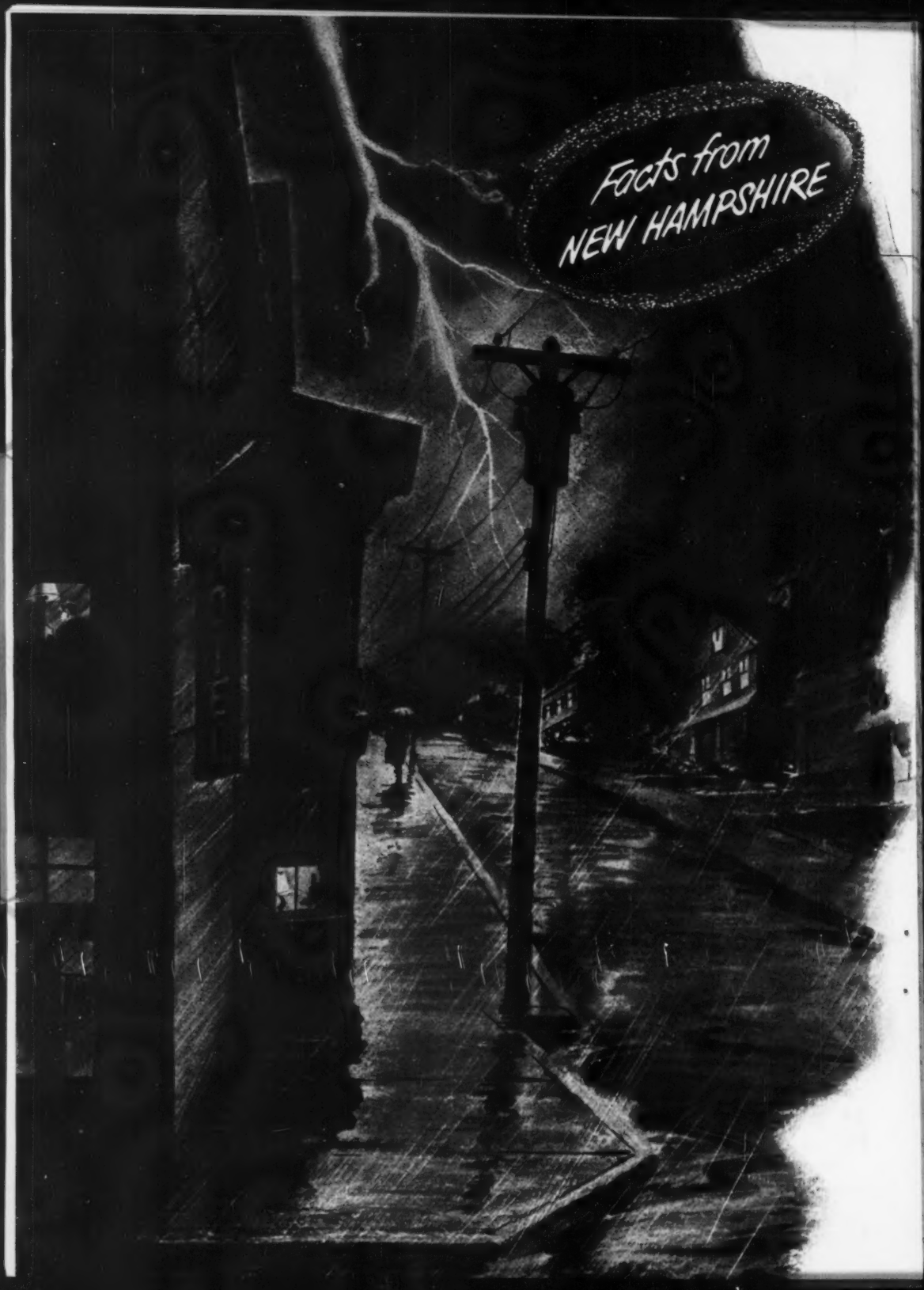
Conventional Distribution Transformers are available for those customers who prefer to supply their own protective equipment. For those who prefer integrally mounted protective equipment, there is available a complete line of CSP (Completely Self-Protected) Transformers. Superior electrical performance is assured in all Moloney transformers as a result of liberal design and quality control.

MEBI-11

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA


Facts from
NEW HAMPSHIRE

"8 Outages a month cut to zero with 'CSP' Transformer"

"Until three years ago, we were having considerable transformer trouble due to lightning. 'CSP' Transformers proved to be our solution," reports a New Hampshire Utility.

"One particularly troublesome 2,400-volt conventional transformer required re-fusing about twice a week during the lightning season. We tried interconnecting it, fused it for 10 amperes, and improved the ground with two extra No. 2 copper ground rods. Outages continued. One time the lightning arresters were actually blown up. We installed a 'CSP' Transformer, without any change in the existing ground, and no outages have been experienced since."

Installation and maintenance costs for "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

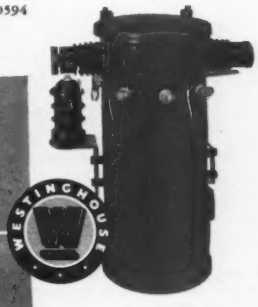
	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% (at $6.52 per outage)
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70594

YOU CAN BE SURE... IF IT'S

Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS



Comparison of Ammonium Sulfamate vs 2,4-D and 2,4,5-T for Brush Control

An analysis of chemical treatments for both weed and brush control. Data are a compilation by E I du Pont de Nemours & Co

SUSCEPTIBILITY OF SPECIES

"AMMATE" (Ammonium Sulfamate)
Superior to 2,4-D, 2,4,5-T for the following:

Red Maple	Poison Ivy	Various Oaks	Chokecherry
Ash (White)	Poison Oak	Black Birch	Sweet Gum
Basswood	Silver Maple	Dogwood	Hickory
Beech	Sugar Maple	Red Elm	Hawthorn

2, 4-D and 2,4,5-T
Superior to "Ammate" for the following:

Osage Orange (Bois de Arc) (2,4,5-T)	Briars (Blackberry-Raspberry) (2,4,5-T)
Box Elder (2, 4-D)	Elderberry (2, 4-D)

Above 20 species are limited lists showing exceptions. Some species, such as conifers (pine, spruce, balsam), greenbriar, and euononymous, are tolerant to both treatments, but drenching sprays of "Ammate" produce more effect than 2,4-D and 2,4,5-T. Many species are susceptible to either treatment, but are killed with one treatment of "Ammate," whereas they may require two or more treatments with 2,4-D and 2,4,5-T, or a combination of same. A few species susceptible to either treatment can be more economically controlled with 2,4-D and 2,4,5-T, such as willow, alder, sumac, and sassafras. Where these species are dominant or where the species listed above under 2,4-D and 2,4,5-T exist, the use of 2,4-D and 2,4,5-T would be recommended. Where mixed species occur, "Ammate" will provide the most economical control over a long term program. If the control area is difficult to reach with spray equipment, the cost of making application (labor and equipment) will equal or exceed the cost of chemical. Under these conditions, it would be recommended that "Ammate" be used to provide maximum control with a minimum of re-treatment.

COST

Assume comparable area of mixed species of hardwoods and brush. Uniform stand 5 to 6 ft high.
300 gal of solution per acre containing 225 lb "Ammate" plus 12 oz of spreader-sticker

"Ammate" ..... @ $0.1675 per lb	= $37.69
Spreader-Sticker ..... @ $5.65 per lb	= .50
	$38.19

Re-treat in 5 to 8 years, dependent on re-seeding and dominance of species which sprout from roots.

An 80% root kill is average expected. Practically 100% top kill.

Test areas re-treated 2 years following application required about 25% original amount of "Ammate." It is conceivable that re-treatment is not necessary at all in most of areas where grass sod is established and prevents re-establishment of woody plants.

2,4-D and 2,4,5-T
200 gal of solution per acre containing 2 gal 2,4-D, 2,4,5-T low volatile ester.

2,4-D, 2,4,5-T @ $0.0939 per gal = $18.78

Re-treat next season and every second year. Tolerant species (ash, red maple, and some oak) would survive and require cutting or "Ammate" treatment.

Costs available indicate second treatment 80% of original or $15.02. Third treatment about 50% of original or $9.39.

In order to compare with "Ammate," these additional treatments would approximate a total of $43.19 plus two additional application costs plus inferior control of tolerant species.

CORROSION

"AMMATE"

Corrosive on certain metallic parts of conventional spray equipment. Reduce by using stainless steel in spray guns and parts replaceable, coating exposed metallic parts of equipment with rubberized "undercoating" used on automobiles. Use air-cooled motors on spray pumps. Use covered wires and spark plug caps.

2,4-D and 2,4,5-T

No problem.

WATER VOLUME

"AMMATE"

Use ¾ lb of "Ammate" per gallon as adequate concentration for control of most brush. 300 gal per acre dosage is satisfactory where growth is from 4 to 5 ft high, but in taller brush amounts up to 450 gal are necessary. Add 4 oz of spreader-sticker per 100 gal of solution to obtain thorough wetting of leaves and stems.

2,4-D and 2,4,5-T

About 66% volume of solution required to provide adequate coverage compared to Ammate solution.

RESIDUAL EFFECT

"AMMATE"

No apparent soil residue after first season. Grasses and weeds growing luxuriantly. Effective residues in plant very apparent second and third season. Regrowth of surviving species suppressed and very often results in death of plant second season.

2,4-D and 2,4,5-T

No apparent soil residue after first season. Grasses and weeds growing luxuriantly. Effective residues in plant disappear after first season. Regrowth normal in vigor.

Comparison of two adjacent plots, one treated with "Ammate" and one with 2,4-D and 2,4,5-T, showed striking differences in development of re-growth. Red maple, which is normally killed to the ground with "Ammate," showed re-growth of 5 to 6 in. the second year after treatment. (Growth was weak and depressed.) The same species on 2,4-D and 2,4,5-T treated area had growth 48 to 50 in. the second year after treatment. (Growth was vigorous and luxuriant.) Part of this growth was original stems not killed to ground by treatment.

PUBLIC LIABILITY

"AMMATE"

Non-poisonous.

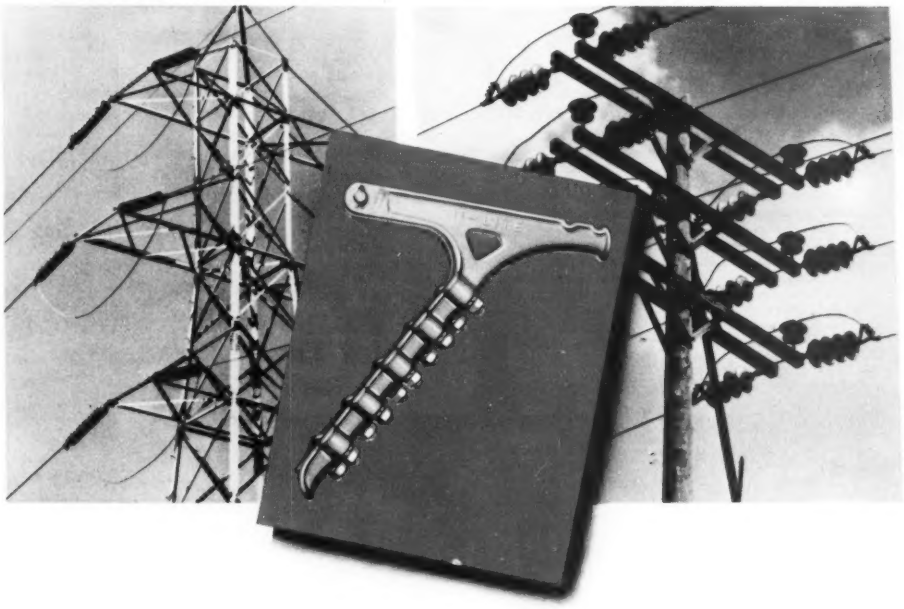
No volatility hazard to adjoining sensitive crops and ornamentals. Atmospheric dilution of "Ammate" spray would be below the amount necessary to injure crops.

2,4-D-2, 4,5-T

Non-poisonous.

Drift and volatility serious. Some crops, such as beans, tomatoes, cucumbers, melons, cotton, and ornamentals are very susceptible to injury from minute amounts of 2,4-D and 2,4,5-T. This could occur from drift or volatilization. Low volatile esters are considerably improved over conventional esters on volatility but are not non-volatile. Amine formulations are superior in this respect.

HI-TENSION NEWS *Junior*



How to Build Trouble OUT of a Transmission Line . . . And at Lower Cost

On many a transmission line, major trouble has developed in somewhat less than *half* the time the lines shown here have served -- trouble resulting from deteriorated contact in jumper splices, leading to increased resistance and severe heating. When there are no splices in these jumper loops, such a thing cannot happen.

It would be worth a substantial premium to eliminate jumper splices. Many an operator would be glad to get rid of them at almost any price. Yet the jumpers shown here cost the *least* to build. The only deadend installation equipment needed in the field is a common hand wrench. The deadend clamp is a basically inexpensive fitting. The installation is quickly accomplished. Cost strongly favors this method. Operating results justify it!

O-B Hi-Lite strain clamps easily produce the continuous cable deadend illustrated here. They are the only hardware fittings designed and made entirely by an insulator manufacturer, to work with the insulators in the single job of supporting the conductor -- and supporting it right.

Build your strain points with continuous conductor. Build them easily, quickly, and inexpensively with O-B Hi-Lite strain clamps.

Ohio Brass

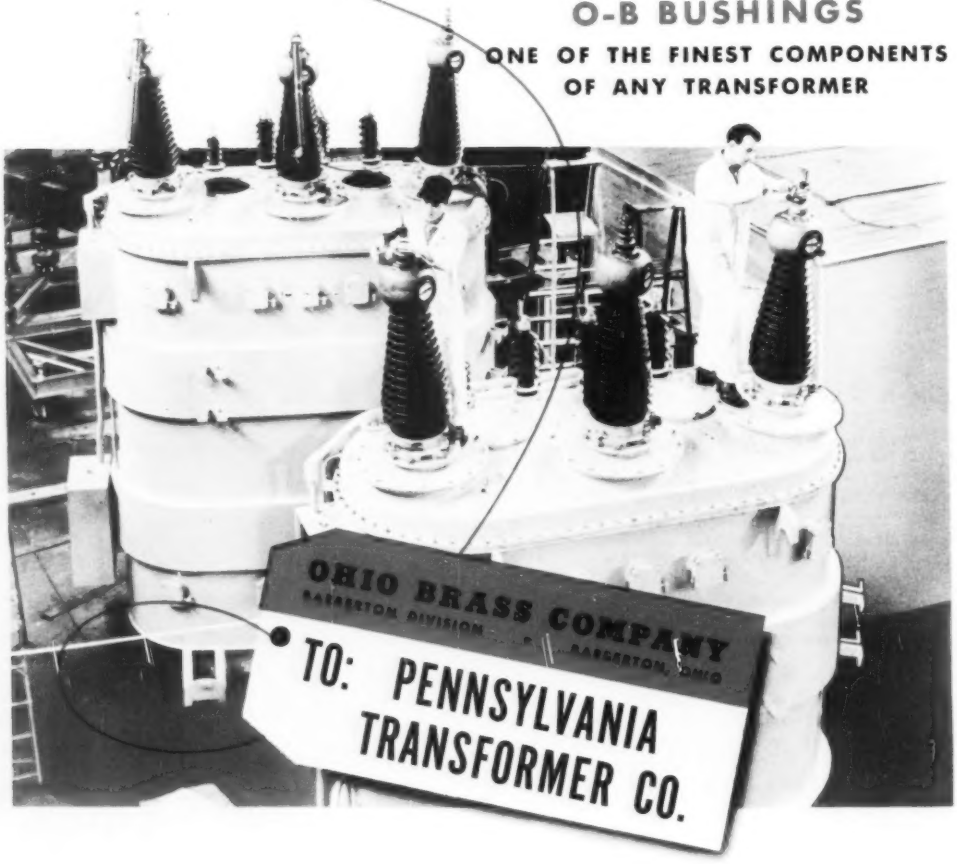
MANSFIELD, OHIO, U.S.A.

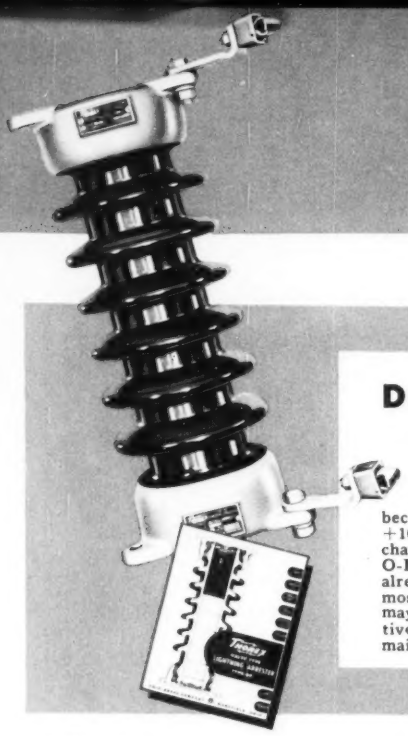
HI-TENSION NEWS *Junior*

Final electrical tests prove the soundness and adherence to specification of these large new Pennsylvania Transformers. According to the manufacturer, a few of the specific facts relating to this equipment are . . . "Rating, 6,000 kva, 3-phase, 60-cycle, 55 degree C. temperature rise, with provisions for fan cooling to increase capacity to 8,000 kva. High voltage, 110 kv (Delta); secondary, 34.5 kv (Y). Tank radiators are shipped separately and installed at erection site. Horizontal reinforcing rings act as bracing for 15-pound tank pressure and full vacuum. These rings also provide additional gas space for the pressure type nitrogen system of oil preservation. Pennsylvania's new improved structural steel base, as shown, facilitates jacking, moving, and painting and was developed after an extensive study of field requirements. In addition to these features, long trouble-free operation is further assured by . . ."

O-B BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER



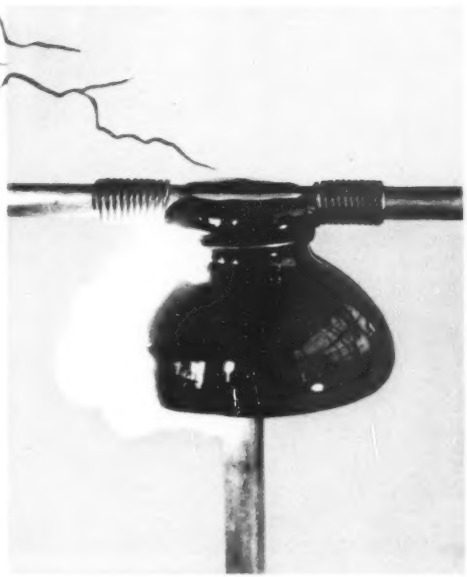


Do You Know the WHOLE Thorex Arrester Story?

Measured from already low average values, the close protective tolerance of O-B Thorex lightning arresters becomes still more significant. With tolerances of less than +10 per cent sparkover and less than +5 per cent IR discharge voltages, based upon fundamentally low averages, the O-B Thorex sets a new protective standard. If you have not already looked into the characteristics of this arrester, your most critical investigation is invited. A personal discussion may be assisted by a previous study of the complete descriptive publication No. 869-H, a copy of which will be gladly mailed on request.

THUNDERSTORM... MADE TO ORDER!

Steep wave impulse testing is often thought to be "big time" laboratory technique, reserved for large, costly insulation. Yet, here is such a test being applied to one of the smallest O-B pintypes. To an insulator of this size, especially, it comes mighty close to natural lightning . . . Every O-B pintype, regardless of size, has been similarly design-tested and then redesigned if deficient, until it will withstand lightning flashover. Such an insulator is too small to *combat* lightning but if one is willing to apply the facilities of a great laboratory to the problem, he can build a pintype that will *survive* lightning . . . This isn't a common property of all pintypes. You can't see it. But such attention to quality accounts for the phenomenal life of O-B pintypes in the field. Isn't it only sound judgment to specify these insulators--*and be sure!*



Ohio Brass

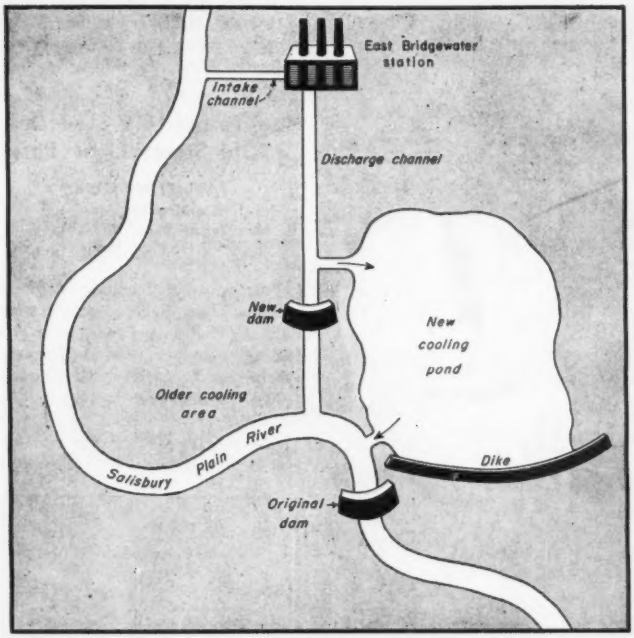
MANSFIELD, OHIO, U.S.A.

This is the deadend that will serve today's and tomorrow's rapidly mounting primary distribution voltages . . . build it only once for economy . . . insulate it adequately . . . because it will carry you a long time into the future if you specify O-B materials.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4135-H



COOLING POND AND NEW DAM to permit full 22,000-kw capacity operation of East Bridgewater station this summer. Pond was created by adding dike below natural depression in the earth, a new dam, and entrance and exit channels for water

Cooling Pond Insures Higher Output

Utilization of a natural depression in the earth as a cooling pond, plus the addition of a new dam, will allow Brockton Edison Co in Massachusetts to realize a potential saving of $30,000 a year on an annual full-load basis at its East Bridgewater steam station. Even with one-third of this saving realized, the improvement is important. Full capacity of the 22,000-kw plant now is made available under hot weather conditions because of a plentiful supply of cooler circulating water.

East Bridgewater station has three units of condensing type which must often be run fully loaded. When the station was started 44 years ago, a major factor in locating it was the choice of the Salisbury Plain River as a source of cooling water. However, loads grew rapidly and the normal stream flow became inadequate.

By building a dam, an artificial pond was created to increase the cooling of the discharged water before re-use. But during continuous recirculation, as time passed, the water grew too hot for efficient service in summer. At such times the artificial pond only permitted continuous operation at about 13,000 kw, though 20,000 kw could be obtained for relatively short periods.

Pending installation of a 60,000-kw unit at Montaup station, East Bridgewater must often be run at 20,000 kw for long periods. This requires cooling water at the rate of 45,000 gpm. Foreseeing this situation, the company purchased about five acres of adjoining land. The area was largely a natural cavity and expensive excavation was not needed.

To utilize this depression, a dike was built and channels opened up (see illustration) to route the discharge water through a new area before returning it to the older cooling area. The new pond area is about three acres and will hold about 3.5 million gal of water. In addition, a new dam was built across the former discharge channel to divert the water into the expanded cooling pond facilities.

During the past winter and spring, improved condensing water tempera-

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

● To her sorrow, this motorist is finding out that poles don't "give" when they're made by Koppers.

Koppers Poles are strong—not only when new, but even after they've been in line for decades. These poles retain their strength because they are made from sound, properly-seasoned wood that has been scientifically and thoroughly pressure-treated with creosote.

Users can aways count on long, trouble-free service from Koppers Poles—the kind of service that makes line operation easier and more economical.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

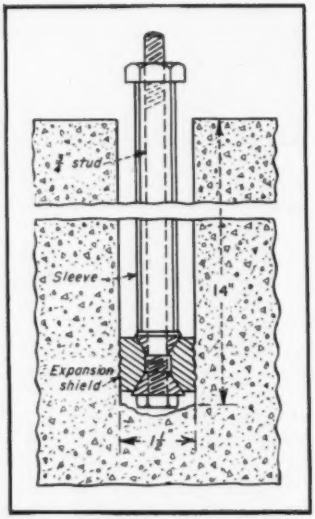
KOPPERS PRESSURE-TREATED WOOD

tures have enabled the plant to be operated at satisfactory ratings. Full benefit of expanded pond facilities will be reaped during the warmer months.

How To Set New Studs In Old Street Light Bases

PAUL E. WIDENOR
Lighting Engineer
New Jersey Power & Light Co
Dover, New Jersey

Pole concrete foundations for a previous street lighting system were utilized to advantage for a new system with aluminum poles almost twice the height. Using the same foundations which had been in place for 25 years not only eliminated the removal of the old foundations and installation of new foundations but avoided



EXPANSION SHIELD tightens against side of hole as nut at top is tightened

other difficulties such as contacting gas mains, water mains, service laterals, and cellars under sidewalks.

Slight modification of each foundation was achieved by chipping out and pointing the top for leveling, also inserting four hold-down bolts or studs. A small notch in the concrete on the curb side serves as a weep hole or drain from the pole base.

Foundation studs were installed in the following operations. A template was used for drilling 1½ in. diam. holes, 14 in. deep in the concrete. Into the hole was dropped an expansion

(*Continued on page* 158)

JOSLYN

BEFORE

Turns Night into Day at Miami Beach

GOOD STREET LIGHTING . . .

1. ***Reduces*** Accidents and Crime After Dark
2. ***Improves*** Appearance and Property Value
3. ***Promotes*** Commercial Trade and Civic Pride
4. ***Appeals*** To Every Progressive, Far-Sighted Citizen

Just Notice the difference in these two photographs taken recently on Alton Road in Miami Beach, Fla.

Joslyn Type 90 Luminaires with 6000 lumen incandescent lamps produced this transformation.

AFTER

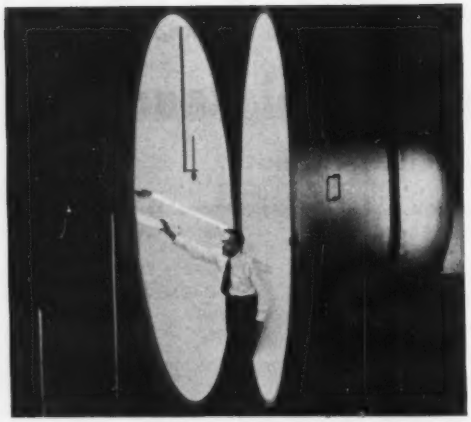
THE JOSLYN CO.
THE SOUTH EAST JOSLYN CO.
SOUTHERN JOSLYN CO.
JOSLYN SOUTHWEST CO.
JOSLYN PACIFIC CO.

JOSLYN MFG. AND SUPPLY CO.

Complete Pole Line Equipment

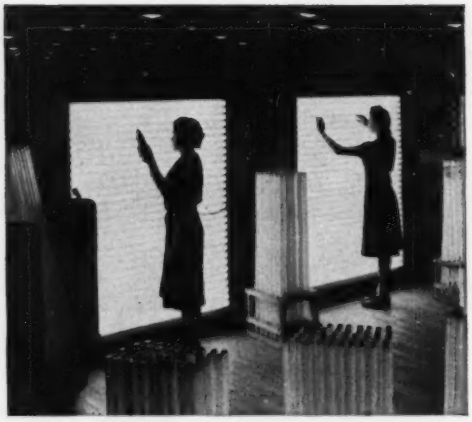
20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

5 big advances in give your customers



1. MORE LIGHT

Photometer test shows G-E fluorescent lamps give more light per watt—both when new and throughout life—than ever before, due to a radically improved phosphor. Cost of light is lower.



2. MORE UNIFORMITY

New materials and manufacturing methods reduce variation in lamps. Your customers save money because lamps don't burn out too soon or *outlast* their efficient life, either. Mass replacement is easier.

5. SHOWS COLORS BETTER

A new phosphor coating makes possible Deluxe Cool White and Deluxe Warm White fluorescent lamps that show colors as they really are. Recommend them wherever best color rendition is important.

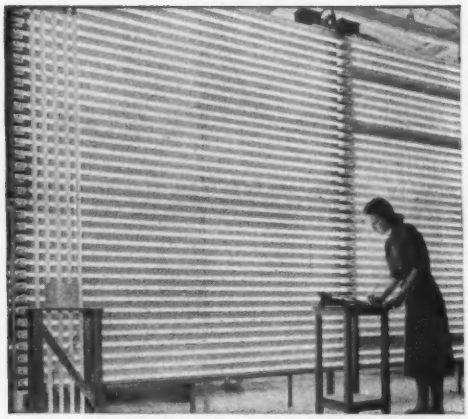
FREE ILLUSTRATED BOOKLET!

Gives helpful information on how to detect and improve inadequate plant lighting. For your copy, write to General Electric, Lamp Division, Dept. 166-EW-8, Nela Park, Cleveland 12, Ohio.

G-E fluorescent lamps more than ever before

3. LESS END BLACKENING

G-E fluorescent lamps now give more light than ever before because lamps blacken less near the ends, as a result of using purer materials and more accurate controls.



4. LONGER LIFE

Due to improved equipment and processes, G-E fluorescent lamps last longer than ever before. Accurate tests on life-racks like this prove it. Lamps don't have to be replaced so often.

SEE BETTER—WORK BETTER

Adequate light is one of the most important factors in getting top-speed, top-quality production. Yet a recent study found substandard lighting in 60% of the plants surveyed.

To help industry raise the quality of its lighting, General Electric works constantly to develop new and better light sources. The new "5-ways-better" G-E fluorescent lamps are one result.

With modern fluorescent lighting, light is spread more evenly, shadows and glare are reduced. Workers are able to see better—work better. Output is increased. Rejects are reduced. Accident rates are lowered. And morale is improved.

To make sure that your customers get the *most* from fluorescent lighting, recommend General Electric "5-ways-better" fluorescent lamps. Newest fluorescent is G-E slimline—world's most modern light source.

You can put your confidence in—

GENERAL ELECTRIC

RCA MICROWAVE SYSTEM

Two links of receiving and transmitting antennas of Central Arizona Light & Power Co., located on roof of generating plant.

RCA Microwave Transmitter-Receiver. The generating plant and each switching station has a transmitter-receiver.

SINCE June 1949, the Central Arizona Light & Power Company, Phoenix, Arizona has used an RCA Microwave System for remote control of switchgear . . . telemetering of voltage, current and power . . . two-way voice communication —between a generating plant and two remote switching stations.

Despite severe lightning storms, temperatures of 140 F, unusual exposure to wind, sand, dust, and insects, RCA Microwave equipment has provided excellent continuity of service.

Reliable Performance, Lower Costs

This modern system of communication costs less per mile to construct and operate than conventional wire or carrier current systems. Parabolic antennas focus transmitted signals to span distances up to 35 miles. Repeater stations provide a path for signals over mountains, rivers and rolling countryside. The equipment is designed for unattended operation and may be installed at locations which are inaccessible for periods of several months. Channels are provided for supervisory control, teleprinter, facsimile, two-way radio, and many other circuits.

RCA engineers are at your service for consultation on microwave systems. Write to Dept. T-31 for complete information.

MICROWAVE COMMUNICATIONS SECTION
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

New Studs

(*Continued from page* 154)

shield to which was attached a stud threaded at both ends. Then a pipe serving as a sleeve was put on the stud and the assembly was adjusted up or down. A nut placed on the top or free end of the stud was drawn down to expand the shield and then turned off. After the sleeve was withdrawn, a rich mixture of sand and cement was poured in the hole, the stud vibrated with a small hand hammer and allowed to set. An average of 3⅓ foundations were completed per day for a total of 72 bases. (The foundations could be completed only as fast as poles could be placed in service.)

Aluminum Signs Need Less Maintenance

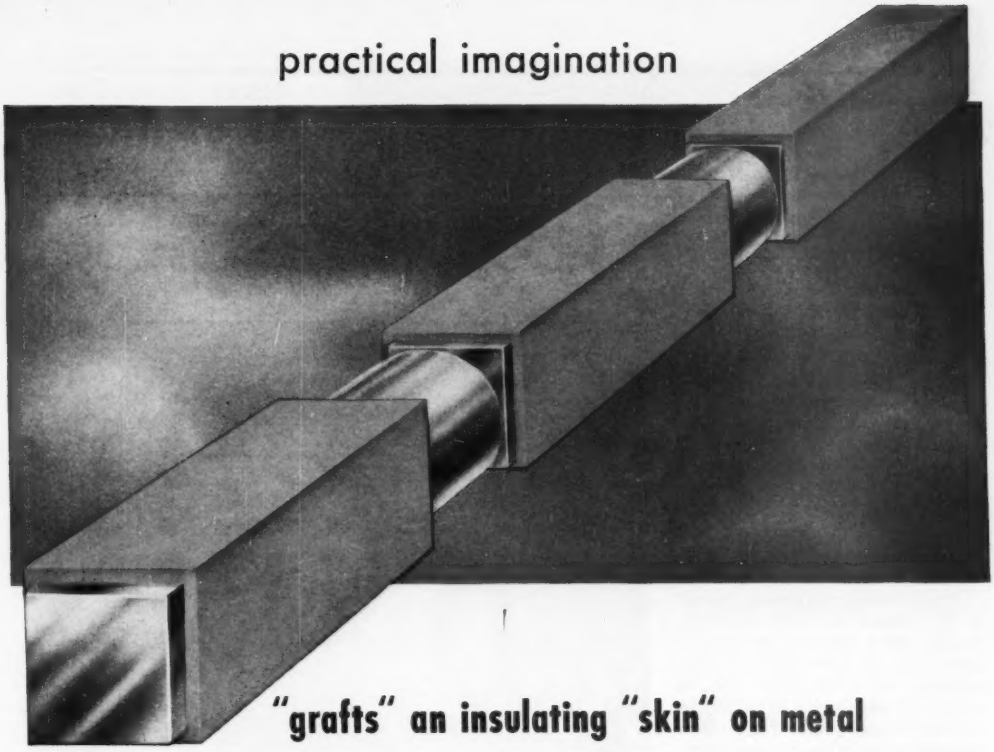
Rustproof and chipproof cast aluminum identification plates are being used by B.C. Electric, Vancouver, B.C., to identify disconnect switches in substation structures. More durable than the previously used enameled metal pieces, the new plates cost approximately half the price of old style

NEW TYPE IDENTIFICATION PLATE of cast aluminum alloy does not chip or rust, costs half the price of ordinary enamel-metal signs formerly used. Plate is easily painted by roller

plates, which were subject to chipping and rusting, and consequently needed constant repainting and frequent replacement.

The new signs are cast so numbers and characters are raised and level with the outer rim. If the paint should eventually wear off, the signs are still legible. Painted with a roller which touches only the top surfaces, the figures are sharply and evenly defined, while the background is left clean. This method obviates the necessity for a professional sign painter, saves labor. The lightweight plates, cast locally of an aluminum alloy, are hung in place with two bolts, placed top and bottom of the 6 x 8-in. signs.

practical imagination



"grafts" an insulating "skin" on metal

Here is another example of the practical imagination C-D engineers can put to work to solve your problems. In this case a heavy electrical connector had to be covered with a safe, efficient insulation. The material best suited to do the job was C-D Dilecto.

The next requirement was to make this insulation an integral part of the whole piece. Here is where practical imagination went to work. The solution was to laminate and mold the Dilecto directly on the metal bar.

When you have a problem involving plastics—whether it is simple or complex—be sure to check with C-D engineers for a practical, unbiased recommendation. They can choose the material best suited to your needs from a wide range of grades of five basic plastics to give you any combination of mechanical, electrical or chemical characteristics. A call to your nearest C-D office will bring you this kind of help any time—all the time.

your partner in producing better products

DILECTO (Laminated Thermosetting Plastic)
CELORON (Molded High-Strength Plastic)
DIAMOND FIBRE (Vulcanized Fibre)
VULCOID (Resin Impregnated Fibre)
MICABOND (Bonded Mica Splittings)

DE-1-51

BRANCH OFFICES: NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES.
WEST COAST REPRESENTATIVE: MARWOOD LTD., SAN FRANCISCO 3 • IN CANADA: DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO 8

Continental Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK 15, DELAWARE

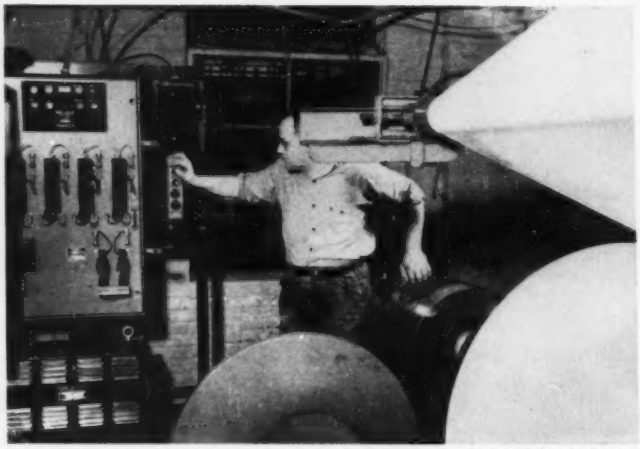
Electronic Drive Boosts Paper Production 25%

A 25% increase in paper production has resulted from the use of an electronic drive on a winding reel at the Lee Paper Co, Vicksburg, Mich.

According to R. L. Hussey, the company's chief engineer, the former output of eight paper rolls a day on this unit has been increased to at least ten since the installation of the electronic control. In addition, the reels are neater, more uniform, and more compact.

Paper tension must remain constant as it is wound on a roll after being treated. Since speed of the paper is constant as it comes from a coating machine, the speed of the roll on which it is wound must be reduced as the roll becomes larger. The problem has been to reduce the speed smoothly, by just the correct amount, and still maintain unvarying tension on the paper.

The process was formerly done manually, the operators had to make frequent adjustments of speed and tension by mere guesswork. The electronic drive now performs the operation automatically.

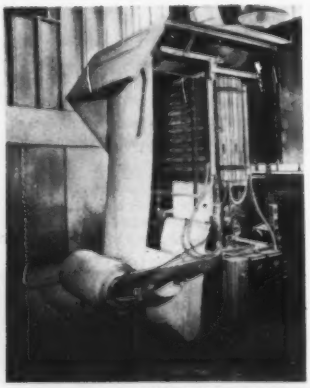


General Electric Co photo

AUTOMATIC ELECTRONIC control on paper winding reel increased daily production 25% over former manual method. Reels are neater, more uniform, and more compact. After 2 yr operation electronic tubes in unit have never been replaced

Run 8 hours a day, the winding machine has been equipped with this control for two years. Electronic tubes in unit have never been replaced.

Radiant Heaters Accelerate Coating Tenfold



Edwin L. Wiegand Co photo

Coating of abrasive cloth has been accelerated tenfold by changing to electric radiant infrared heaters. The former heat source permitted a maximum web speed of ¾ ft per min compared to 8 ft per min now attainable at the Simonds Abrasive Company, Philadelphia, Pa.

The compact installation for coating the cloth with a synthetic resin and curing under infrared heat is shown in the photograph. In this operation rolls of cloth impregnated with abrasive grit are first fed through a dip tank; next, pressed through rollers to squeeze out excess fluid; then passed between radiant heater banks for curing; and lastly, rewound on rolls.

ABRASIVE CLOTH COATING is upped 10 times by 24-1400-w infrared radiant heaters—nine heaters on the front and back and three on each side. Heaters are operated two in series on 460 v. Total heating capacity is 33.6-Kw. Forced ventilation removes volatiles through hood

To completely and uniformly heat the 27 in. wide cloth, 24 of the 230-v, 1400-w radiant heaters are used. There are nine heaters on the front and back and three on each side. The 230-v heaters are operated two in series on 460 v. Total installed capacity is 33.6 Kw. The volatiles given off in the baking process are removed by forced ventilation through a hood above heaters.

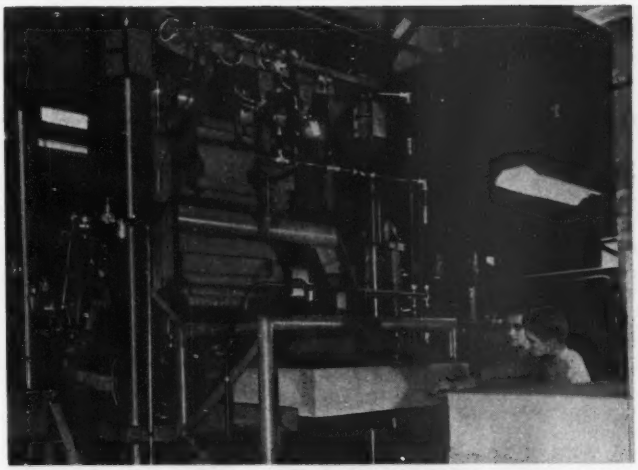
INDUSTRIAL BRIEFS

Light Flicker was completely eliminated at the Alabama Marble & Granite Co, Gadsen, Ala., by the installation of a flywheel on the motor shaft of a twin cylinder air compressor. Before flywheel was installed (at suggestion of M. H. Lucky, Industrial Power Representative, Alabama Power Co, Anniston, Ala.) this 20hp, 1200 rpm, 3 phase, 220v motor caused light flicker with every stroke of the air compressor.

Super-Cycle (360-cycle) portable power tools widely used at General Motor's assembly plant, Framingham, Mass., reduce weight and make job easier for operators. A typical 360-cycle tool weighs only 20 lb compared with 36 lb for a 180-cycle similar tool.

Modern Materials Handling and production line methods at the Pola Brick Co, East Windsor Hill, Conn., converts raw clay into finished brick in 28 hrs. Process saves 2 to 3 weeks, compared with open air sun drying. Equipment includes a motor-driven winch hauling dump cars up incline to clay mixing hopper; screw conveyor and then belt conveyor serving brick making machine; wire rope conveyor serving oven type dryer; electric crane delivering 1,200-unit pallets to kiln cars; and crane transferring kiln-fired (1800-2000 F) and finished bricks to storage or outgoing transport. Annual production is 20 million bricks; demand about 280 kw; monthly energy consumption about 100,000 kwhr; powerfactor 93%; and 3-ph, 4,800 to 480-v substation capacity 500 kva. Operates 24 hr. per day.

High Bay Lighting with reflector lamps materially reduced maintenance costs normally encountered in conventional high bay installations at the Steel Fabrication Plant of Gemco Engineering and Manufacturing Corp, Woodlawn, Ohio. Highly efficient in-built reflectors of these lamps provide 32 ft-c average maintained intensity on working plane. Lamps are 750-w located on 17½ x 20-ft centers and mounted 35 ft above floor.—H. E. Vogel, Industrial Lighting Engineer, Cincinnatic Gas & Electric Co.



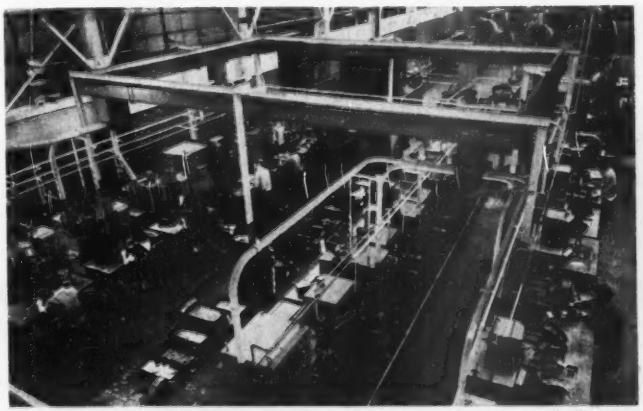
BAKING TIME of cork composition mats is reduced to minutes from 6 to 12 hr by dielectric heat—replacing steam heated ovens. Capacity and efficiency are upped

Dielectric Heat Cuts Cork Baking Time

Cork composition baking time is cut to minutes by dielectric heat at the Armstrong Cork Co, Lancaster, Pa. The previously-used method, employed steam heated ovens and required 6 to 12 hr. This drastic reduction in heating time required in the baking of cork mats, necessitated that the entire cork baking and preparation operation be streamlined.

After synchronizing all of the auxiliary operations with the new high-speed heating process, the entire production line has been modernized, resulting in enlarged capacity, increased efficiency, reduced wastage of raw materials, and improved quality. Completely automatic and continuous, new operation is guided by 500 relay contacts, 150 microswitches.

Bus Loop Reduces Voltage Drop



RESISTANCE WELDERS ranging from 10 to 75 kva are fed from 1500-amp bus loop that reduces voltage drop to a minimum and simplifies wiring at Westinghouse Electric Corp's Beaver, Pa., works. Supply cable to each of the 18 welders runs from tap box in nearest corner of loop. Transformer is 428 kva, 2300/230v

SALES AND SERVICE

RESIDENTIAL • RURAL
COMMERCIAL

FLUORESCENT FIXTURES provide 80 to 90 ft-c illumination throughout the general office areas. Tubular sunlamps (cross-wise on the ceiling) provide, in an eight-hour day, the equivalent of 15 minutes in the summer sun

PRIVATE OFFICES offer the best of working conditions with fluorescent lighting, sunlamp, green cork board

Suntan and Germicide Lamps Used in Westinghouse Office

Sunshine every day, 80 to 90 ft-c of lighting on every desk, bright and varied colors on walls to provide cheerful surroundings, acoustical sound-proofing, and complete air conditioning with germ-killing, bactericidal lamps in the air ducts are features of the new Westinghouse Northwestern District headquarters, located in Chicago's Merchandise Mart. The 46,000 sq ft of new offices are considered by the planners to represent "the most advanced step yet taken to improve the lot of the office workers and increase efficiency."

While not claiming anything entirely new, the designers explained that their efforts had been directed toward bringing together most of the best features in office design in a single installation with the idea of having an office unexcelled from the standpoint of health, morale, and efficiency. The one "first" claimed was the unique fluorescent sunlighting.

Fluorescent sunlamps are so spaced as to give each office worker a minimum daily dosage of sunlight but in quantities small enough to avoid sunburn. A total of 220 of the new fluorescent type sunlamps were installed on the ceiling over all working areas. Over the general offices the lamps produce in an eight-hour day the equivalent of 15 min in the summer sun. In the private offices, where the executive is away from his desk more frequently and often out of town on business trips, concentrating reflectors aim the fluorescent sunlight in stronger doses. These units can give a suntan in several hours if the executive chooses. He can turn them on or off at will. Varied bright colors are used on office walls.

"Call Your Shots" Contest Nets $10 per Customer

Montana-Dakota Utilities Co has completed a 10-weeks "Call Your Shots" sales campaign in which merchandise sales totaled $907,113.43. The company has less than 90,000 customers which means that in 10 weeks the sales amounted to more than $10 per customer. Average sales in 1950 were more than $30 per customer.

Only 48 full time salesmen are employed. Sales campaigns are designed to enlist the support of all employees and a "sales-minded" attitude on the part of all employees has been developed to a rather remarkable degree.

The "Call Your Shots" campaign was launched in a big three-day sales conference held at Rapid City, S. D. There were 275 in attendance including sales and management personnel of the company and representatives from

"Cuts cost three ways"

with Westinghouse MERCURY lighting

A tank company in Illinois ran cost studies on the new Westinghouse Mercury Lighting System. Results:

1. Operating costs are reduced because mercury vapor produces more light per dollar than any other light source.
2. Maintenance costs are cut because it takes fewer fixtures to produce high levels of illumination than with any other lighting system.
3. Lamp replacement costs are lower, because mercury vapor lamp life is 5,000 hours—5 times longer than the most efficient incandescent lamp.

This is one of hundreds of "time-tested" installations. Investigate the Westinghouse Mercury Vapor Line: 400, 1000 and 3000-watt units for low or high-bay areas . . . open or closed fixtures for clean or dirty locations . . . low or high-voltage ballasts for any distribution system.

Send for B-4727, **"Westinghouse Lighting at Work" in every industrial area.** Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

HN ELECTRICAL JOBBERS **CROWDER JR.** CO MOTORS REPAIRED

Allentown, Pa. 5-1551 - Easton, Pa. 9191 - Bethlehem, Pa. 1-0540

444-448 UNION ST., ALLENTOWN, PA. - 824 LEHIGH DRIVE, EASTON, PA.

YOU CAN BE SURE.. IF IT'S

Westinghouse

LIGHTING DIVISION

Edgewater Park, Cleveland

J-04295

Combines All Four

EVERY requisite that sound construction needs demand are combined in *Crapo* Galvanized Steel Strand—

1. High strength
2. Ruggedness
3. Long life
4. Economy

The superior tensile strength inherent in steel is utilized to fullest advantage in each size and grade of this time-proved strand. The heavy, ductile, tightly-adherent galvanized coating—applied by the famous *Crapo* process—provides dependable protection to the steel, extends the life of the strand beyond the normal period of replacement.

Specify *Crapo* Galvanized Steel Strand for guys, messenger and overhead ground wires! There is a size and grade for every practical need available for prompt shipment.

ASK YOUR JOBBER!

Consult your nearest distributor of *Crapo* Products or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE INDIANA

The "Call Your Shots" promotional booklet was filled with stimulating proclamations and slogans

the appliance manufacturers and the utility industry.

Following the big sales conference, all-employee meetings were held in each company division. In these meetings the local management people whipped up interest and enthusiasm to get all employees behind the promotion.

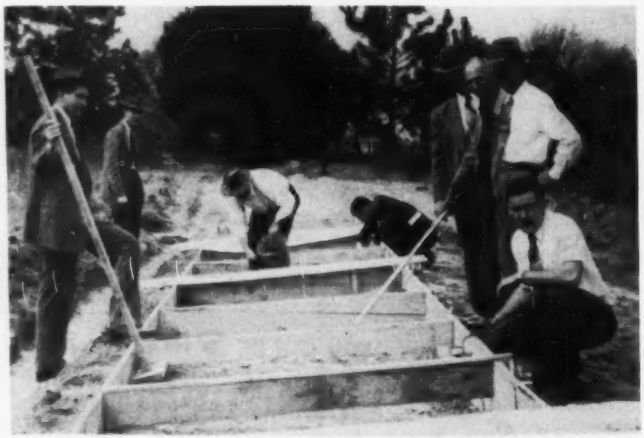
When the campaign was launched a "Call Your Shots" promotion booklet was published and distributed. In it R. M. Heskett, president, acting as "Governor" of the realm, signed a proclamation authorizing the Sales Hunt. W. L. Hayes, sales manager, acting as "Game Commissioner," called upon all employees to "Shoot To Win." A hunting license was issued to every employee authorizing him to "hunt all types of sales without restriction." This was signed by R. M. Heskett, "Governor," W. L. Hayes, "Game Commissioner," and R. T. Bennett, "Chief Warden." Mr. Bennett is assistant sales manager and is in charge of promotional activities.

The "Call Your Shots" booklet also introduced leaders in the contest and outlined ten separate sales contests, one for each week of the sales campaign. First week was the Prairie Chicken contest in which each merchandise sale represented a prairie chicken bagged and the Division knocking down the most birds in relation to their quota was declared the winner.

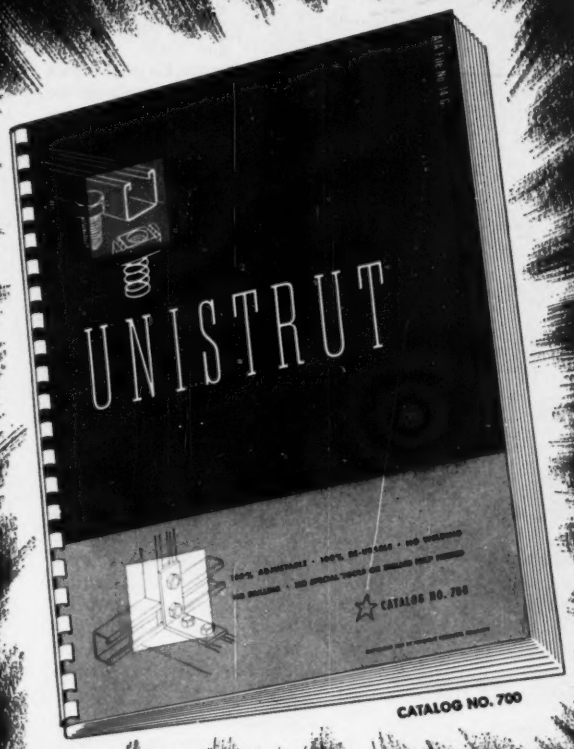
This was followed by the Partridge, Pheasant, Canvasback Duck, Antelope, Mallard Duck, White-Tailed Deer, Redhead Duck, Elk, and Canadian Goose contests. Hunting tips were provided. Sales ammunition was made available and everybody was called on to Shoot To Win.

Winners of the ten-weeks' "Call Your Shots" contest were declared Grand Hunting Champions and awarded the Heskett Trophy, the Montana-Dakota Utilities Emblem of Sales Achievement.

Will Electric Heat Control Tobacco Fungus?



BLUE MOLD is the tobacco growers' number-one problem. Elimination, or major reduction, of it is the hope that started the experiment here illustrated and in which Georgia Power Co's rural division is cooperating with other agricultural agencies. Tobacco seed is being planted in a sectionalized bed. Each section will be electrically heated to a temperature slightly different from those adjoining. In this way the best temperature for growing tobacco plants—and the worst for growing blue mold—will be determined



NEW

FREE UNISTRUT CONSTRUCTION CATALOG!

78 Illustrated Pages on How to Frame, Hang, Support and Mount many kinds of Mechanical and Electrical Equipment with UNISTRUT All-Purpose Metal Framing

Simple and Complete . . . Easy to Use . . . Loaded with Pictures, Data and Complete Information . . . Shows Details of Product and Applications . . . How to Order

Get Acquainted with UNISTRUT Today! Write for Your New Free 78-page Construction Catalog 700

With UNISTRUT you can build all types of framing, mounts, shelving, racks, tables and benches—conduit, cable, pipe and tubing hangers and supports—fluorescent fixture supports, and many other structures with just a hacksaw and a wrench.

UNISTRUT is metal channel with a continuous slot. You simply insert the UNISTRUT spring-held clamping nut into the channel at approximate point where attachment of another framing fitting is desired, slide to exact location and bolt to UNISTRUT fitting.

UNISTRUT includes concrete inserts, roller pipe supports, brackets, clamps and many other standard parts which in combination provide the world's most flexible system of support or suspension. UNISTRUT does the complete job—you need no other parts or materials.

UNISTRUT is trim framework—provides great strength without bulk. It's easy to work with, lasts indefinitely, and the finished structure assures neat and orderly appearance.

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd., Chicago 7, Ill. Dept. WE
Representatives and Warehouse Stocks in Principal Cities
Consult your Telephone Directories

The World's Most Flexible All-Purpose Metal Framing

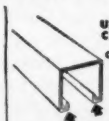
U. S. Patent Numbers
2327587 2363382
2329815 2380379
2345650 2405631
2541908
Other Patents Pending

UNISTRUT IS *Bonderized!*

Please send items checked below, without obligation:
☐ Catalog 700 ☐ 24" x 36" Wall Chart
☐ Free Unistrut Sample

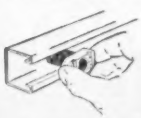
Name_____
Company_____
Address_____
City_____ Zone____ State_____

Only **UNISTRUT** GIVES YOU THIS FAST CLAMPING, LOCKING ACTION AND THIS COMPLETE ADJUSTABILITY AND RE-USABILITY

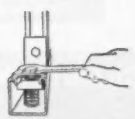


1 WEDGE SHAPED INTURNED EDGES TO TAKE SERRATED GROOVES OF UNISTRUT NUT

2 SERRATED GROOVES "BITE INTO" INTURNED EDGES OF CHANNEL FOR POSITIVE CLAMPING ACTION.


3 INSERT SPRING NUT ANYWHERE ALONG CONTINUOUS SLOT OF CHANNEL . . .

4 ROUNDED EDGES OF NUT PER. MIT EASY INSERTION. SPRING (YOUR THIRD HAND) HOLDS NUT SNUGLY IN PLACE FOR BOLTING.


5 ASSEMBLE FITTING, NUT AND BOLT—A TURN OF THE WRENCH, IT'S DONE.

UNISTRUT PRODUCTS COMPANY 1013 WEST WASHINGTON BLVD., CHICAGO 7, ILLINOIS

Sales and Service Notes

• Residential and farm customers of the Public Service Co of Northern Illinois set new high records in the use of electricity for the year ending April 30, 1951. For the first time in the history of the company, residential users averaged 2,000 kilowatt hours for the year, a 100% increase over a ten-year period. In the year ending last month, the company's farm customers used an average of 4,852 kilowatt hours, an increase of 200% over the 1,600 kilowatt hour average of ten years ago.

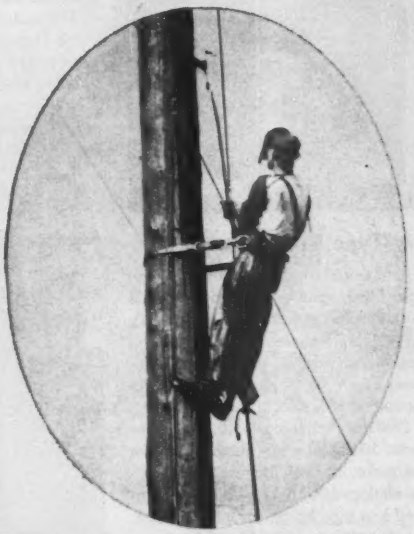
• Hampden County Law Library, Springfield, Mass., has modernized an antiquated lighting installation which used 2,500 w in general illumination and 40-w incandescents with reel-type extension cords for stack service. New general lighting is by 400 and 600-w units in lens boxes aggregating 10,000 w and giving intensities of 40 ft-c horizontally and 30 to 10 ft-c from top to bottom of stacks. Searchers for books no longer have to hold a portable lamp in one hand within the stacks. Modernization by Western Massachusetts Electric Co.

• Street lighting improvement in Dayton, Ohio, resumed in 1946 after interruption by the war, is expected to be completed in June, 1952. Remaining to be done is installation of new lights in residential areas. The whole program includes over 8,000 new lights, of which about half are replacements of old luminaires. Intensity has been doubled on 28 primary thoroughfares and on 98 secondary streets. Sodium units are used at dangerous intersections. Large use is made of multiple circuits with photoelectric controls, of which some 1700 have already been installed.

• The "tried and true" testimonial technique features a mailing and handout piece that New York State Electric & Gas Co is using these days to promote electric cooking and water heating. In it are 8 letters from happy customers, each identified by name and address. Typical is a letter from Mrs. Vivian Harris, Burlington Flats, N. Y., which, after reciting the improvement over bottled gas, ends with this comment, "You may gather from this that I like electric cooking. Well, by gracious, I do."

New preservation methods add years of life to standing poles

POL-NU is easily applied with simple pressure grease equipment. A grease-impervious covering is then wrapped around the treated area.



Applying the PENTA Preservative with special spraying equipment, the worker starts at the top and comes down . . . working around the pole.

GROUND LINE TREATMENT with Chapman Pol-Nu

This new wood preservative, in grease form, was developed for ground line treatment of untreated poles or of old butt-treated poles needing added protection. It contains 5% PENTAchlorophenol by weight. Tests prove that on application the preservative penetrates the vulnerable sapwood to give lasting protection against destructive ground-line decay and insect attack. The application of Pol-Nu gives several years of additional service life at an average cost of only 50c to 75c per year.

ABOVE GROUND TREATMENT with Penta Preservative

This new preservation method is for full-length protection of standing poles originally given only ground-line treatment. Penta is ideal for this purpose because it is highly toxic to wood destroying fungi and penetrates readily at normal temperatures. This effective preservative is permanent, economical, safe to handle, non-poisonous to animals. Tests have proven that Penta definitely stops shell rot and top rot. It's clean! It's certain! Conforms to A.W.P.A. Specifications P8-49 and P9-49.

Write for complete data and recommendations on these new methods.

CHAPMAN™

CHAPMAN CHEMICAL COMPANY

Dermon Building, Memphis, Tenn.

333 No. Michigan Ave., Chicago 1, Ill.

Terminal Sales Building, Portland 5, Ore.

NEW EQUIPMENT

Dry-Type Transformers

A new line of general purpose, dry-type transformers featuring class B insulation has been announced by GE.

For single-phase, 60-cycle operation, new design provides smaller transformers at an average weight reduction of 30%.

The line will ultimately consist of about 50 models in ratings of 3-kva and more. It will include transformers equipped with two five per cent rated-kva taps below primary voltage, transformers for 32-volt applications, transformers for boosting and bucking applications, general light and power service, and auto transformers for general light and power.

Photo shows 7.5-kva type of unit with class B insulation which superseded model with class A.

General Electric Co, Schenectady

•

Branding Machine

Identification for cables and conductors is "typed" on Vinylite tubing with this new Vari-Typer.

The "typing" operation brands the marking into the tubing.

Special heating device maintains the correct temperature necessary to deposit leaf carbon into the brand.

The unique feature of this machine is the fact that its type is changeable. Thus tubing from ⅛ to ½ inch can be branded with the maximum type size.

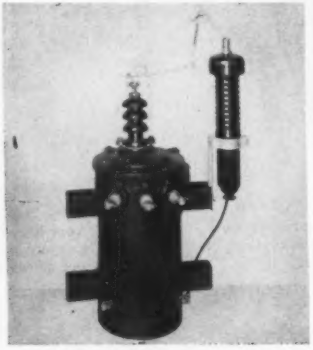
Special symbols and foreign languages are available.

Ralph Coxhead Corp, Newark, N. J.

•

Arrester Fuse Combination

A new unit, the Crystal Valve and Keystone Arrester-Fuse combination, is especially adapted for installation



on transformers for rural circuits where the line-to-ground voltage is from 7200 to 7600 volts.

Fuse is placed between the arrester line terminal and the transformer primary bushing. This puts the arrester ahead of, or on the line side, of the fuse and relieves the fuse of the strain of carrying the impulse and follow-current during the lightning arrester operations.

Protection is given the circuit in case of bushing failure since the fuse is connected ahead of the primary bushing.

Arrester and fuse may be installed on old or new transformers, in or out of service.

The combinations can be used with all standard open-link fuse links up to 50 ampere capacity.

Electrical Service Manufacturing Co, 17 and Cambria Streets, Philadelphia

Noise Level Meter

Noise, sound, and vibration may be measured with the 410-B sound level meter.

Sound level range is 34 to 140 db above the standard ASA reference level of 0.002 dynes per square centimeter.

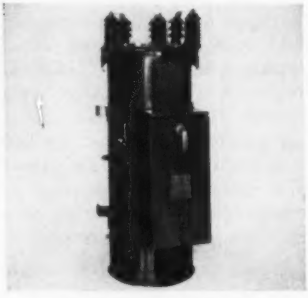
Hearing-aid batteries used in this unit have an operating life of about 50 hours.

Hermon Hosmer Scott Inc, 385 Putnam Ave, Cambridge 39, Mass.

•

Voltage Regulator

A sixteen-step, pole-type feeder voltage regulator for rural and suburban lines or substations has been added to the line of regulators manufactured by Westinghouse.



Providing ±10 per cent regulation in sixteen 1¼ per cent steps, the URL-16 is available in ratings from 12.5 to 76.2 kva single-phase, and at standard voltages of 7,620 and below.

The tap changer, with direct motor

JOHN LINEMAN SAYS:

For Secondary Service

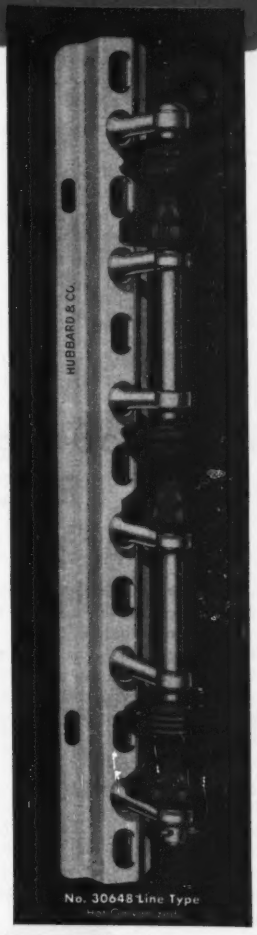
HUB-RAKS COME FIRST

"Gosh, right through the center of every hole."

"I thought I was husky, but I'm not in it with the HUB-RAK."

"For back-to-back mounting, bolts do double duty."

"If there's a place to hang it, there's a hole to match."



HUB-RAKS are furnished for 1 to 4 line wires with conductor spacings from 4 to 12 inches.

"Points strong as an ox . . . smoothly rounded too."

"Highest grade porcelain insulators, smooth surfaces, sure easy on conductors."

"Installation or replacement . . . it's dead easy with the HUB-RAK."

"It sure is the finest rack ever made."

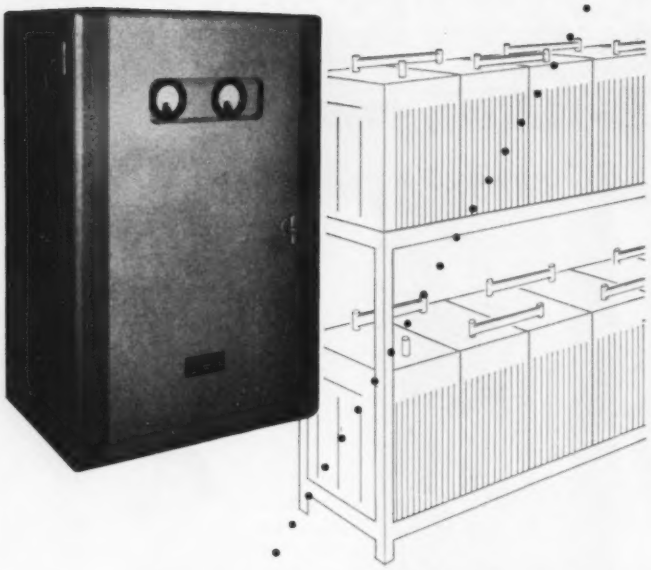
HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

for LONGER battery LIFE



keep the floating voltage constant with PECO Automatic Battery Chargers

The PECO Battery Chargers accurately float the control battery of any power station or substation which has a reasonably constant switchboard load; furnishes power to the load and maintains a fully charged battery, ready for any emergency.

To provide extreme accuracy of electronic control and the exceptional reliability demanded by this type of service, Power Equipment engineers designed this PEC-626 Automatic Battery Charger by starting with the rugged components of a manual charger, then added a magnetic system for coarse voltage control and a simplified electronic system for fine voltage control.

As an illustration of the accuracy of the PECO charger, this example can be used: the DC output is sufficient to maintain 60 lead acid battery cells at 129 volts; it will also furnish power to switchboard loads within the rating of the charger, and at all times the output voltage is automatically regulated to within ± 0.5 percent, for AC line voltage fluctuations of ± 5 volts on a 230 volt circuit.

Exceptional reliability is shown by the fact that if the electronic control section should be disconnected, the magnetic control section will still automatically hold the output voltage to within ± 3 percent of nominal voltage.

Write for complete specifications today.

POWER EQUIPMENT

Battery Chargers ☆ Battery Eliminators ☆ D.C. Power Supply Units ☆ Regulated Exciters ☆ and other Special Communications Equipment

55 ANTOINETTE STREET DETROIT 2, MICHIGAN

Company

drive, is oil immersed. A reversing switch provides the 10 per cent regulation on either side of the regulator neutral position.

This unit is equipped with the CJ-1 package control relay, which includes motor control, voltage regulating relay, and auxiliary relays mounted on a common drawout chassis.

Separate resistance and reactance line drop compensation provides a full range of line drop compensation even if the regulator is carrying as little as 67 per cent of rated load.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.

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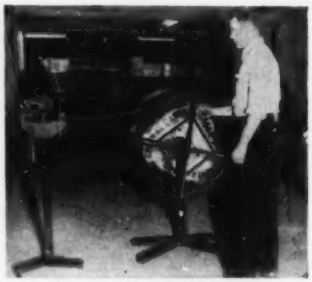


Cable Meter

Lengths of cable and wire rope, ⅜ to 1½ inches in diameter, can be measured accurately with the model 450 cable meter.

This unit incorporates a click over counter which operates in either direction.

Counter automatically decouples as material end passes through meter.

An operating handle holds the measuring wheel in open position or applies pressure for metering.

Hy Kon Manufacturing Co, 163 East State St, Alliance, Ohio.

•

Class H Insulation Dry Type Transformers

A new line of dry type transformers with class H insulation for station auxiliary, unit substation and network service has been announced. Ventilated units are manufactured in ratings up to 3000 kva and in voltages up to 15 kv. Sealed-in-nitrogen units in sizes up to 2000 kva, 15 kv and below.

Class H insulation used consists of inorganic materials such as glass, porcelain and asbestos bonded or im-

(*Continued on page* 174)

New Arrester

Westinghouse Type LX provides highest short circuit capacity available today!

Here's a completely new expulsion-type arrester that brings you the kind of protection you've been looking for. Note how these features contribute to more positive protection . . . longer arrester life.

Highly current limiting—a longer arc path over a spiral course limits follow current flow through the arrester to a fraction of available fault current.

High surge discharge capacity—well over NEMA requirement of 65,000 amperes.

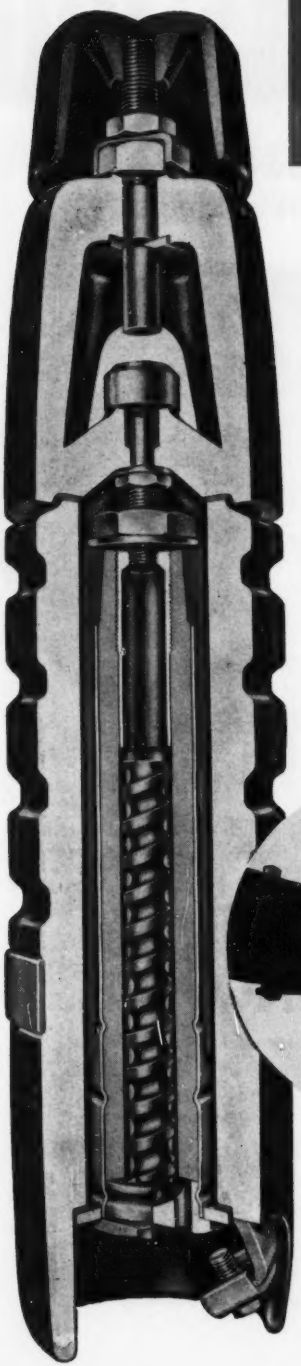
Low and consistent sparkover—skillful design has produced a gap of considerable length which sparks over at very low value.

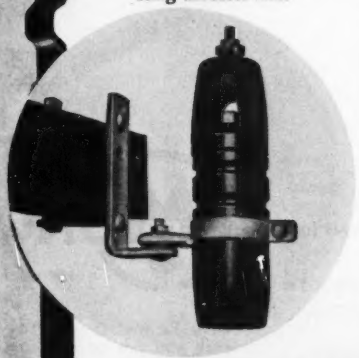
Low IR drop—since the arc drop is the only voltage that appears across the arrester during the flow of surge current, the discharge voltage is inherently low.

Operating elements totally enclosed—available with enclosed isolating gap (as shown) or with external isolating gap at bottom. With polyethylene cap (slight extra cost), fully enclosed type has no exposed metal parts at line, ground or intermediate potential. Cap pushes on; no metal springs, no turning necessary.

Easy voltage identification—each ring on main porcelain body indicates 3 kv of rating. For example, cutaway arrester pictured is 9 kv, arrester in inset is 3 kv.

Longer life—limitation of power follow current insures exceptionally long arrester life.





Descriptive Bulletin 38-150 explains how this revolutionary new LX design brings you these matchless benefits. Ask your Westinghouse representative for a copy or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60764

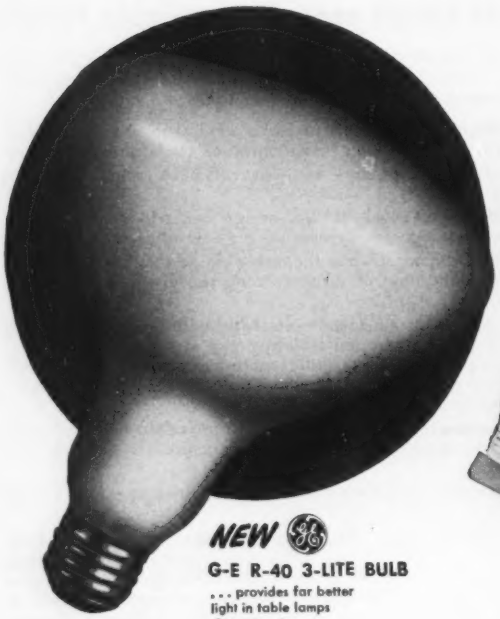
3-kv, Type-LX, "De-ion®" Expulsion Lightning Arrester with crossarm mounting bracket. This arrester has a short-circuit rating of 20,000 amperes. Ratings range from 3 to 15 kv.

YOU CAN BE SURE... IF IT'S Westinghouse

LIGHTNING ARRESTERS

PLUG INTO THIS BIG

Now G-E Lamp Division and Monowatt bring you two new developments for table lamps.



NEW (GE)
G-E R-40 3-LITE BULB
. . . provides far better light in table lamps
$1.15 plus tax

NEW
MONOWATT IMPROV-A-LITE
. . . converts table lamps for 3-way light
approximately **$1.69**

THE FEATURES

G. E. brings together three sales features in *one bulb* for table lamps:

1. New shape directs light both upward and downward . . . gives indirect over-all light, makes seeing tasks easier.

2. New inside white finish—the "Q" coat —diffuses light evenly, reduces glare.

3. Three brightness levels—150, 100 or 50 watts.

Featured in the newest portable lamps, this indirect 3-lite can also be enjoyed in old lamps by converting them with the Monowatt adapter.

MONOWATT
A DEPARTMENT OF GENERAL ELECTRIC COMPANY

Easy To Install—Improv-A-Lite makes it easy and *fun* to rewire lamps for 3-way, indirect light.

Kit includes an already wired socket, and Monowatt's new Quick Clamp Plug (just clamps on the end of the wire). No electrical connections to make.

Now your customers can have just the right amount of light from their present table lamps for reading, entertaining, TV . . . any occasion.

DOUBLE PROMOTION

YOUR ADVERTISING SUPPORT

Commences with 2 Big Dominant ads in the POST Sept. 29, 1951

PLUS **famous FRED WARING TV SHOW October 7th**

YOUR MERCHANDISING HELPS

1. TWO POINT-OF-SALE DISPLAYS

3 PANEL DISPLAY UNIT — 28″ x 20″. Flashing light behind lamp shade. Bulb and Improv-A-Lite are mounted in position from stock by retailer.

DEMONSTRATOR—11″ x 14″. Comes with Improv-A-Lite. Add bulb from stock. Available at cost of Improv-A-Lite.

2. "HOW TO WIRE LAMPS" 16 page booklet tells your customers how to convert their present lamps and make new ones. Shipped in reasonable quantities, no charge, with orders for Improv-A-Lites.

3. ADVERTISING SUGGESTIONS

Mats: 2-3 col. x 10″; 2-2 col. x 6″; 1-2 col. x 8″

Radio Spots: 1 minute announcements; 35 word chain breaks

TV — 50-second commercial available on film at all Lamp Division District Sales Offices

4. ENVELOPE STUFFERS

Describe the advantages of bulb and Improv-A-Lite. Available in quantity at cost of $.45 per hundred.

Your Sales Plan

Send for this brochure . . . gives you suggestions for developing a complete R-40—Improv-a-Lite promotion program, including:

- Counter and Window Displays
- Consumer Booklet "How to Wire Lamps"
- Newspaper ad mats
- Motion Picture
- Television and Radio spot announcements
- Publicity releases
- Envelope Stuffers
- Catalog Sheets

Be Ready

Sept. 26th to Oct. 10th From POST date through Fred Waring TV show

You can put your confidence in—

GENERAL ELECTRIC

• Completed Trouble Free Positive Connection

GREATER DISTRIBUTION SYSTEM Security WITH NEW ONE PIECE K-90 AND K-900 CONNECTORS

EASY AS A B C TO INSTALL

For

GREATER STRENGTH: — Compresses conductor sealing out high resistance oxide formations on contact areas.

GREATER EFFICIENCY:—Retains high pressure contacts during vibration and temperature changes.

GREATER DEPENDABILITY: —Surpasses Mercurous Nitrate Specification ABW 124-1*, insures against seasonal and stress corrosion cracking failures.

GREATER ECONOMY: — Lower installation cost, four sizes for connections up to 500 MCM.

GREATER FLEXIBILITY: — Taps, splices and dead ends easily completed with gloves or hot line tools.

* Identical to ASTM B-154-45 Mercurous Nitrate Specification except ABW-124-1 specifies stressed components which is a more severe test.

A—Hang on Main

B—Spin Nut to Partly Close

C—Insert Tap and Tighten

Consult one of our nearest 19 representatives or contact our main office.

Write today for Bulletin K-150 on K-90 and K-900 Distribution Connectors.

ANDERSON · BRASS WORKS, Inc.

POST OFFICE DRAWER 2151

BIRMINGHAM, 1, ALABAMA

• SOLDER AND ALUMINUM POWER CONNECTORS, FITTINGS, AND BUS SUPPORTS
ALUMINUM SUSPENSION AND STRAIN CLAMPS

New Equipment

(*Continued from page* 170)

pregnated by the silicone resins or rubbers, or by the fluorocarbon resins.

Class H transformers are reported to be:

1. Fire and explosion resistant
2. Moisture resistant
3. Heat stable
4. Capable of operating in high ambient temperatures
5. Smaller in size and weight than class B dry type transformers.

Pennsylvania Transformer Co, PO Box 330, Canonsburg, Pa.

•

Wireholder

Featuring a new frame assembly which is held snugly to the side grooves of the insulator with a copper rivet, this improved wireholder provides a dead end pull of 1800 pounds, a 90 deg side pull of 1600 pounds and a 45 deg side pull of 1750 pounds.

All steel parts are hot dip galvanized. Insulator is available with a dry process white or brown porcelain. **Line Material Co, Milwaukee, Wis.**

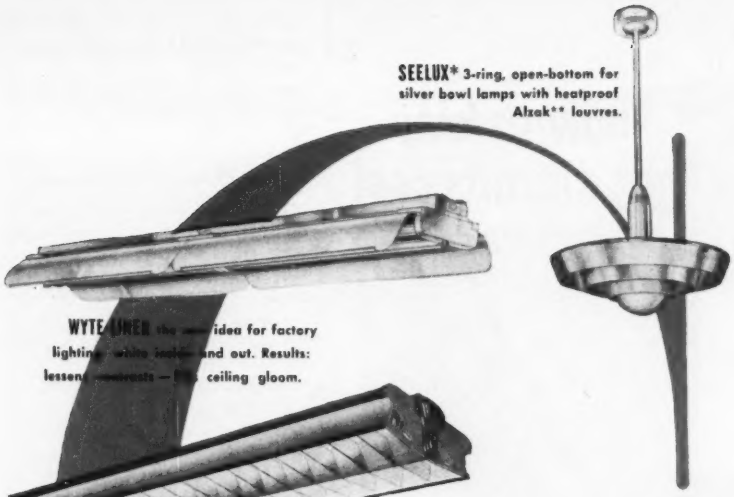
•

Countershaft Drive

A wide range of speed changes for low speed machinery is possible with this new unit.

Drives from 2 to 15 hp are available.

This unit is designed so that the complete assembly with combination



SEELUX* 3-ring, open-bottom for silver bowl lamps with heatproof Alzak** louvres.

WYTE-LINER the new idea for factory lighting: white inside and out. Results: lessened contrasts — less ceiling gloom.

GUTHLITE* swings down for easy maintenance. 43% uplight, 57% downlight.

LITE-BLOK TROFFER comprehensive line — ribbon of light — super constructed.

ARISTOLITE* louvered plastic panels swing apart for easy cleaning from floor.

Guth

the complete line of fluorescent *and* incandescent fixtures

High-Bay Dome Glass Alzak

INDUSTRIAL INCANDESCENT reflectors for better light control at the working plane.

These are merely a few examples. Our line includes any fixture for any effect you may wish.

It is easy to plan with GUTH fixtures

May we send you our catalog?

LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

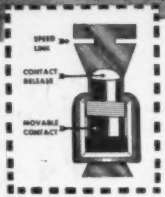
*® and Patents Pending

**® and Patented, Aluminum Co. of America

how to keep hot circuits cool

Trion

DUAL ELEMENT TRIPLE PROTECTION FUSE WITH THERM-A-TRIP



HOW IT WORKS

A short circuit blows speed link instantly. Therm-A-Trip (matched to thermal capacity of the motor or transformer it protects) also opens circuit when safe surrounding or load temperatures are exceeded. Provides adequate protection with extra long time delay.

Trion — THE THREE-IN-ONE FUSE

TRION is the coolest operating fuse of any type.
TRION gives instantaneous cut-off on short circuit.
TRION controls rate of rise of recovery voltage.
TRION has longest safe time-lag of any overload protective device,
TRION's time-delay averages five times longer than any renewable or one-time fuse.
TRION starts heavily loaded motors safely.
TRION protects against single phasing.
TRION's watt (power) loss is substantially lower.
TRION's tripping temperature provides a heat ceiling 500° F. lower than any zinc link fuse.
TRION reduces and controls the heating of switches and fuse clips.
TRION permits the use of switches of lower rating.
TRION keeps hot circuits cool.

A TRION FOR EVERY CIRCUIT

Trions are available in 141 Standard Sizes ranging from 1 to 600 amps for both 250 and 600 Volt circuits. Other sizes for these same voltages range from 1/10 amp to 9 amps. Midget Sizes (3/8" dia. by 1 1/2" long) vary from 1/10 amp to 10 amps. ASK FOR TRION OR WRITE FOR FREE TRION BULLETIN #506-A TODAY.

"Look to Shawmut for leadership"

THE CHASE-SHAWMUT CO.
370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

sheaves may be used or parts of the assembly may be combined into other types of drives.

Speed Selector Inc, 118 Noble Court, Cleveland 13, Ohio

•

Three-Phase Transformers

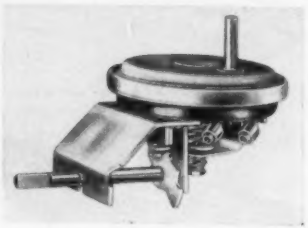
A new line of dry type, air cooled transformers has been announced. All sizes are completely enclosed in a steel case constructed around steel frame.

Capacities from 9 to 225-kva in primary voltages of 600, 480, and 240 volts are available.

Secondaries include two 5% or four 2½% taps.

Acme Electric Corp, Cuba, N. Y.

•



Air Pressure Switch

Rated at 10 amps, 115 volts ac, this spdt unit contains an actuating diaphragm whose movement operates a snap-action switch.

Operating point may be adjusted from 7 to 10 inches of water column (nominal).

Acro Manufacturing Co, Columbus 16, Ohio

•

Dielectric Heater

A new self excited vacuum tube unit has been developed for speedily bonding wood, formica, or plastic.

Operation is at 27.12 mc. Penetration is said to be ⅛ to 2 inches.

Wood Welder Manufacturing Co, 2758 Whittier Blvd, Los Angeles

•

Cable Connector

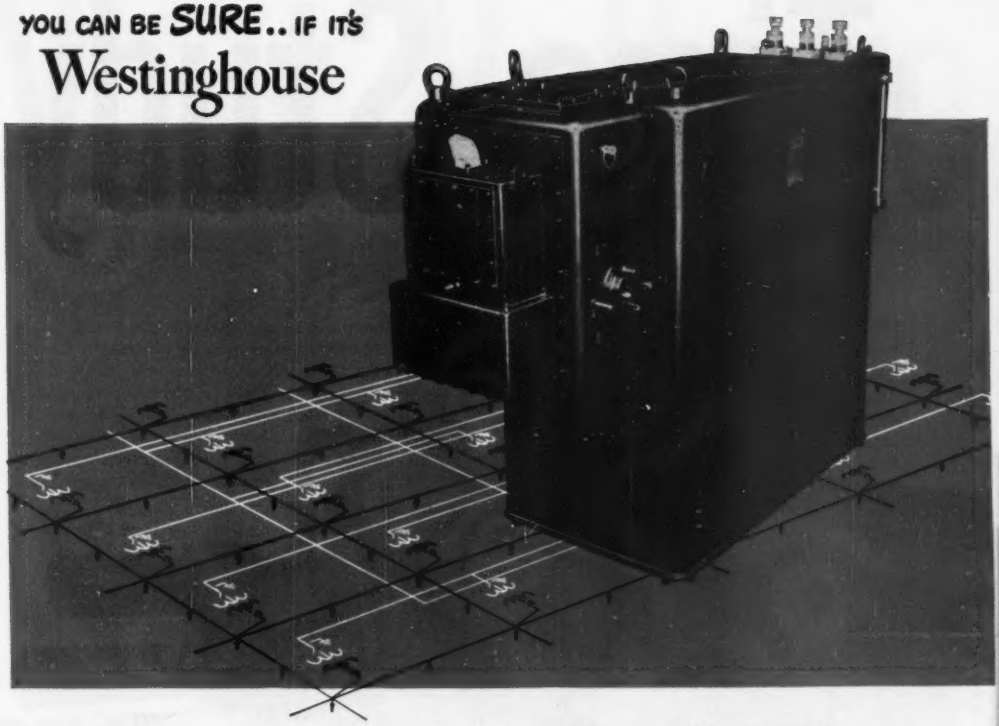
One piece construction of the 9,000 series aluminum to aluminum or aluminum to copper connector reportedly simplifies handling and installation.

Usable with or without a spacer bar these connectors have completely en-

(*Continued on page* 180)

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



where SAFETY is ESSENTIAL...

install the Safest Transformer ever Built

When network transformers must be installed in areas where people gather... or where extreme conditions of dust, corrosion or water exist... wherever conditions are too severe for other transformers, install a Westinghouse Sealed Dry-Type Transformer. It's economical, too, because vaults may be eliminated.

No matter what type of network system you plan, or what your installation problems may be, Westinghouse can help you keep costs down ... now ... and in the future.

HERE'S WHY:

Now—There is a Westinghouse Network Transformer specifically designed to answer each of your network problems. In addition to SEALED DRY-TYPES, there are "ASL" VENTILATED DRY-TYPES, ideal for indoor service; LIQUID-FILLED (oil or Inerteen®), most economical for general use; and TYPE "S", pole-mounted to bring network advantages to less dense areas. Standardized construction provides lower initial cost and lower installed cost, too. Special hook-up problems are eliminated.

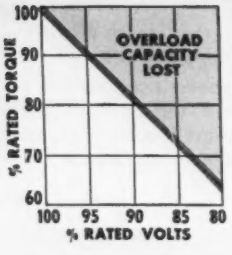
And in the future—Years of leadership in the design and construction of network transformers show in the high quality and maintenance-free operation of Westinghouse Transformers. In addition, our complete facilities... engineers and calculating boards ... are available to help you in your network planning, to make future expansion more economical.

Ask your Westinghouse representative for further information, or write for Booklets B-4082 and B-4002-A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70558

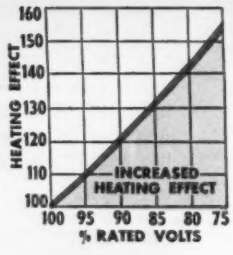
Westinghouse

NETWORK TRANSFORMERS

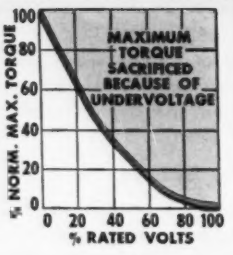
Time-Study



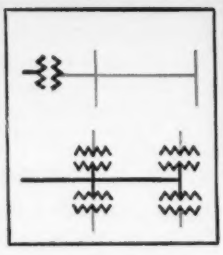
FULL PRODUCTION demands that rated voltage be maintained to all motors. Overload capacity, that extra push necessary for short intervals on many processes, falls off rapidly on undervoltage . . . falls approximately 10% for every 5% drop below rated voltage.



MOTORS BURN OUT quicker at undervoltage because of increased heating effect. Overload relays in the controls protecting your motors trip because of the extra current through them, open circuits to motors — cause machine down-time and production loss.



JOBS TAKE LONGER because torque and horsepower drop when voltage drops. Less torque means lighter cuts on lathes, shapers and other machine tools. More time must be spent to get the same job done. More overhead, more manhours must be figured into every job.



A MAJOR CAUSE of undervoltage is voltage drop in secondary feeders. Existing systems may not be adequate for new production schedules. Install A-C Substations at load centers to reduce line losses, cut feeder length, hold proper voltage, increase production.

Your Voltage

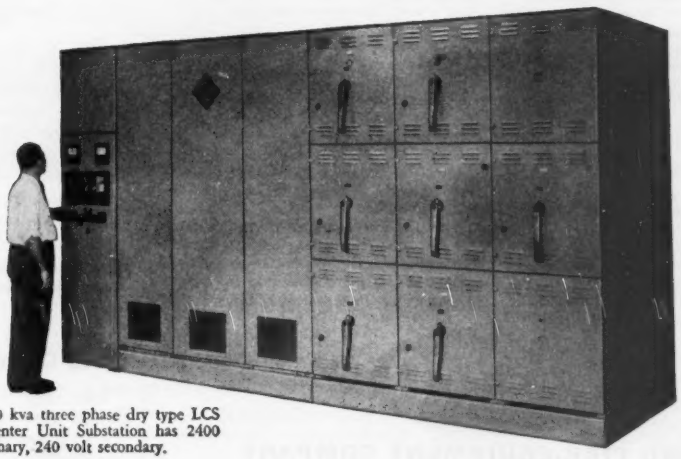
STOP WASTING MANHOURS on slow producing machines. Get the most from the production equipment in your plant by installing unit substations to correct undervoltage. No electrical equipment gives top performance *unless* it operates at rated voltage . . . and even well designed distribution systems may prove inadequate because of today's added loads and increased production schedules.

For example, if your squirrel-cage motors operate at 10% undervoltage, maximum torque available to start machinery is reduced 19% . . . heating effect within the motors is inceased 21% . . . overload capacity falls, efficiency drops.

Increase your output by eliminating production slow-downs resulting from overloaded motors . . . machine down-time due to tripped starters or circuit breakers. Install Allis-Chalmers LCS Unit Substations at load centers and eliminate excessive line drop by shortening low voltage cables. Allis-Chalmers LCS Load Center Unit Substations are neat, compact, easy to install, and provide protection to personnel.

You can count on the cooperation of experienced Allis-Chalmers substation engineers in working out your distribution system. Get in touch with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for bulletins 11B6285A, 11B6325B and 11B6895. A-3371

LCS
LOAD CENTER
Unit Substation



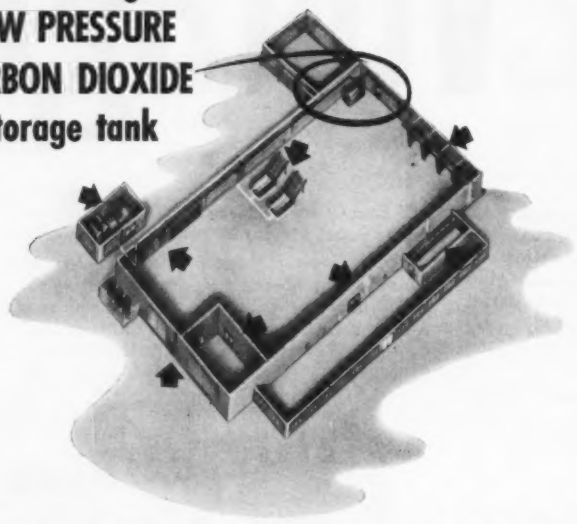
This 750 kva three phase dry type LCS Load Center Unit Substation has 2400 volt primary, 240 volt secondary.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Plant-Wide Fire Protection

from a single LOW PRESSURE CARBON DIOXIDE storage tank



Now, your larger size fire hazards can be protected more efficiently at less cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area . . . to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Flexibility is the keynote of these new type C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons . . . discharge facilities can either be manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs. Future plant expansion is easily and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank and adding the supplementary discharge facilities at a later date.

C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems are built with the same superior design and high quality workmanship that have characterized C-O-TWO High Pressure Carbon Dioxide Type Fire Extinguishing Systems for many years. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

So, with current expensive delayed replacements, why not let an expert C-O-TWO Fire Protection Engineer help you now in planning fully approved fire protection facilities for your various properties. Complete free information and descriptive literature is yours for the asking! Get the facts today!

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems Built-In Smoke and Heat Fire Detecting Systems

New Equipment

(*Continued from page* 176)

closed threads that permit ready salvage for re-use.

The 9,000 AC series for aluminum to copper connections employs a cast aluminum female half and a cast bronze male half with a plated copper spacer bar which has its plating removed from the copper side.

Fargo Manufacturing Co, Poughkeepsie, N. Y.

•

Electric Oven

Constructed of heavy gauge steel with Fiberglass insulation, model HT portable electric oven has a range of 100 to 800 F.

Operation is on 110 volts. Thermostat, outside reading thermometer, and pilot light are standard.

Grieve-Hendry Co, 1101 North Paulina St, Chicago 22, Ill.

•

Dual-Channel Oscilloscope

Use of two independent channels working into a single two-gun cathode ray tube permits high or low frequency phenomena to be viewed either singly or simultaneously.

Each channel is supplied with an independently operating sweep generator. Both channels may be switched to the same sweep, allowing the examination of two related phenomena on a common time base.

Electronic Tube Corp, Philadelphia

•

Speed Control

The Type 1700-B Variac Speed Control offers several new features for 1/3 hp motor control.

Combination of a Variac with a selenium rectifier and choke furnishes a source of adjustable armature voltage for operating dc shunt or compound motors over a wide range.

Speed can be controlled from rated

(*Continued on page* 184)

99.5%

BONNEVILLE reports:

TROUBLE-FREE SERVICE FROM IT'S C-D CAPACITORS

Bonneville Power Administration reports that its C-D capacitors have so far delivered over 1,100,000,000 Kvar hours of 99.5% trouble-free service — an unmatched field performance record!

a typical time-tested C-D installation

C-D 18,790 Kvar sub-station, part of 20,160 Kvar purchased for Longview in 1942.

A C-D engineer will be glad to point out the many dollar-saving characteristics of C-D capacitors.

CORNELL DUBILIER ELECTRIC CORP. DEPARTMENT D 81 SOUTH PLAINFIELD, N. J.

CORNELL-DUBILIER CAPACITORS 1910 1951

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO

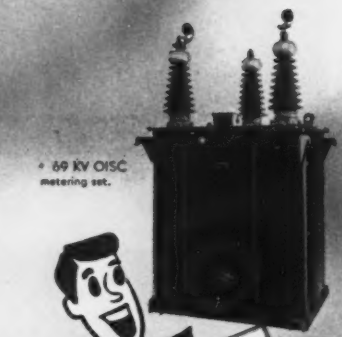
Standard
TRADE MARK ®

TRANSFORMERS. . .

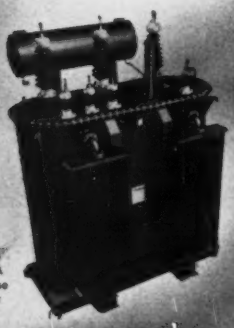
• Dry type load center unit sub 1,000 KVA.

BUILT TO YOUR REQUIREMENTS TO SERVE A SPECIFIC NEED

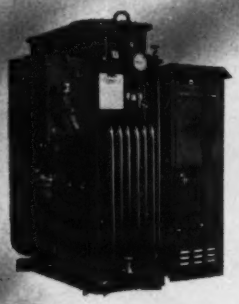
● In addition to standardized designs and types, The Standard Transformer Company has a long established record of engineering and manufacturing transformers exactly suited for specific operations. Our one job, for more than a quarter of a century, has been to produce transformers. There has never been sacrifice of materials, methods or skills in producing Standard's quality product . . . basic construction is unsurpassed. Complete freedom to specify accessory equipment, permits closer adherence to job requirements.



• 69 KV OISC metering set.

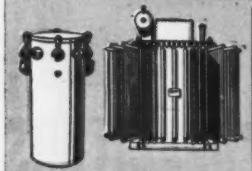


• 3,000 KVA OISC 3-phase 69 KV power transformer.

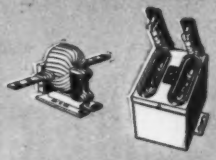


• Askarel load center unit sub 300 KVA.

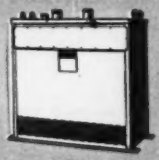
TRANSFORMERS FOR EVERY APPLICATION



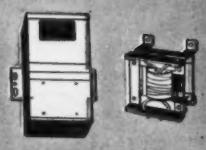
Liquid filled (sizes up to 10,000 KVA and 72 KV Inc.)



Instrument transformers (for use on circuits up to 72,000 volts, Inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)



Control transformers (compound filled or open type)

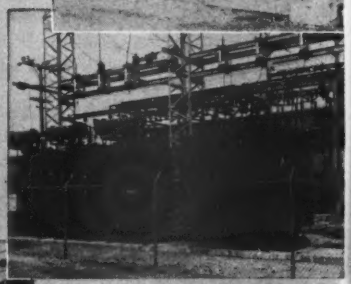
Standard TRADE MARK ®

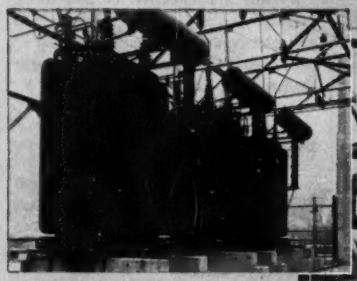
. . . . . ON THE JOB

• An installation helping to power atomic research.

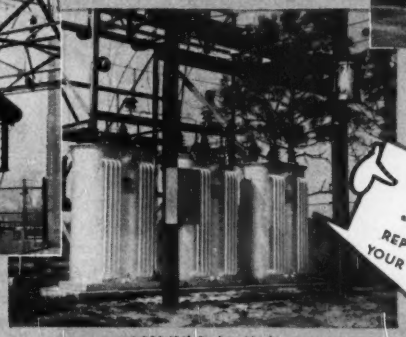
PROVES SUPERIORITY THROUGH LONG LIFE AND TROUBLE-FREE PERFORMANCE

• Hundreds of The Standard Transformer Company's transformers are installed and operating all over the world today, and considerable evidence proving long years of trouble-free service by Standard transformers flows into our offices daily. Factual testimony proving efficient performance is ample. Our engineering staff and production teams are geared to cooperate efficiently with servicing your order. For the complete story — write for our brochure "Standard transformers . . . on the job."





• A 15,000 KVA substation, Mill Creek Pumping Station, Cincinnati, Ohio.



• 1,000 KVA Bank at Myrtle Beach, South Carolina.

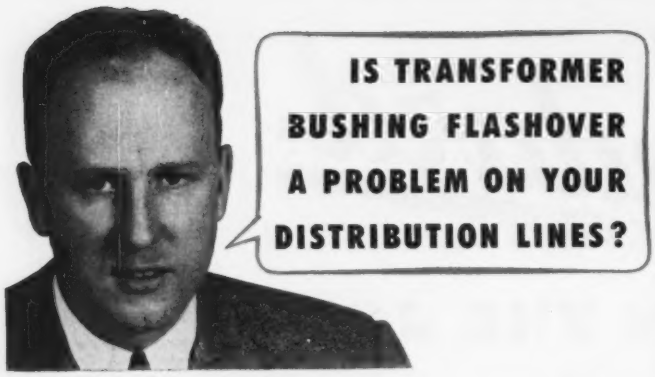
• Three 2,000 KVA single phase and one 5,000 KVA 3-phase transformers serving a large manufacturing plant in the Midwest.

SEE YOUR NEARBY Standard TRADE MARK REPRESENTATIVE FOR ALL YOUR TRANSFORMER NEEDS

THE Standard TRADE MARK TRANSFORMER CO.

WARREN . . . OHIO

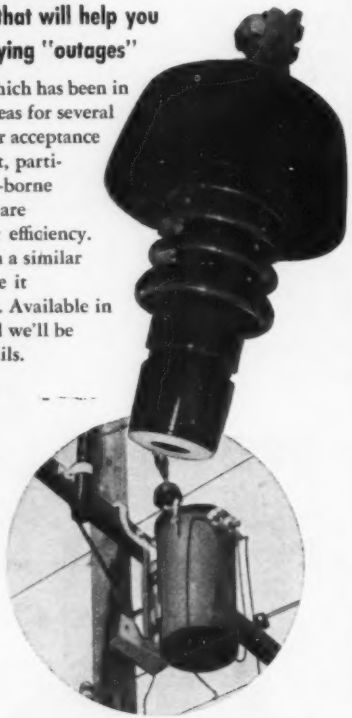
(REPRESENTATIVES IN PRINCIPAL CITIES)



If it is, then here is an idea that will help you to eliminate costly and annoying "outages"

It's the Pinco L 5206 Fog Cap which has been in use on installations in coastal areas for several years and is now finding popular acceptance wherever "fog" conditions exist, particularly in those areas where air-borne industrial and chemical wastes are a constant menace to insulator efficiency.

So if you are confronted with a similar problem, we can help you solve it with the Pinco L 5206 Fog Cap. Available in various sizes. Drop us a line and we'll be glad to give you complete details.



FEATURES OF THE PINCO L 5206 FOG CAP

1 **PROTECTS** upper part of bushing from contamination; also keeps it dry, thereby maintaining an effective leakage path.

2 **ELIMINATES** annoying service interruptions caused by bushing "flashover."

3 **EASY TO INSTALL** on present equipment. Just remove bushing terminal and place PINCO L 5206 Fog Cap in position and replace terminal. Cap is equipped with coroprene gasket.

The Porcelain Insulator Corporation
781 Main St., Lima, N. Y.
Sales Agents: JOSLYN MFG. & SUPPLY CO.
Offices in Principal Cities

PINCO INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain

New Equipment

(*Continued from page* 180)

motor speed down to zero.

The rpm rise in speed between full load and no load is roughly the same at all speeds and is about 400 rpm.

The very low ripple in the armature circuit limits torque pulsation and makes it possible to use standard motors at their full rating.

General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass.

•

FM Radio Housing

Accessibility of Motorola FM 3-way mobile radio housings is said to have been greatly increased by the addition of a new split housing.

These new housings permit the chassis to be lifted out of the lower section of the housing, making it possible to mount mobile units in lowered automobile trunks.

Motorola, 4545 W. Augusta Blvd, Chicago 51, Ill.

•

Metering Pumps

Stainless steel construction for a new line of small capacity metering pumps makes them suitable for laboratory work.

Pumps are effective in dispensing photographic solutions, biologicals and pharmaceuticals.

Mechanical Products Corp, 168 North Ogden Ave, Chicago 7, Ill.

•

Plating Rectifier

Designed for electro-plating and electro-chemical industries a new full wave selenium unit provides either 150 amps from 0 to 8 volts or 75 amps at 0 to 16 volts.

A calibrated magnetic circuit breaker provides protection at all settings.

Electric Rectifier Co, Rochester 2, N. Y.

•

Adjustable-Speed Motor System

Sixteen forward, sixteen reverse steps of speed adjustment with full dynamic braking are provided by a new Baldor motor system.

Fundamentally a Ward-Leonard system, this system consists of an MG set, a controller, and a drivemotor

MAMMOTH *of the* MISSISSIPPI

Venice No. 2 Steam Power Station, Venice, Illinois

Following a report on the industrial power needs of the Union Electric Power Company area made by Stone & Webster Engineering Corporation, we were retained to design and construct this 400,000 kw Steam Power Station. The station, located at Venice, Illinois, on the banks of the Mississippi River, has established an outstanding record for efficiency and reliability.

STONE & WEBSTER ENGINEERING CORPORATION

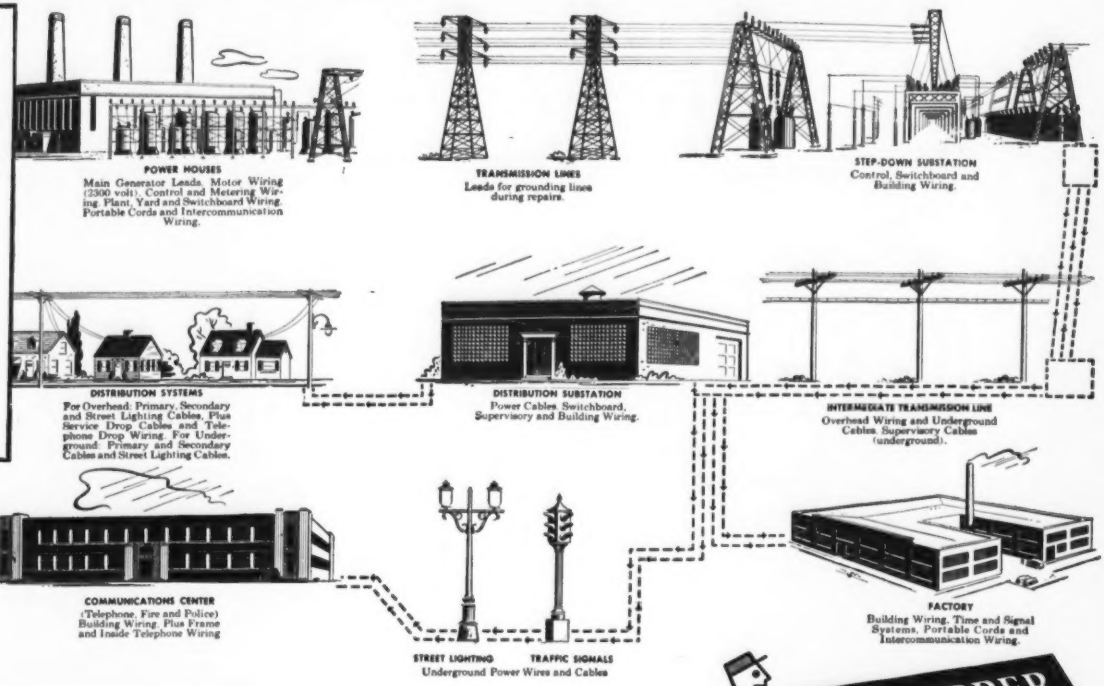
A SUBSIDIARY OF STONE & WEBSTER, INC.

You can solve any power puzzle

with U. S. Rubber Electrical Wires and Cables

For over 60 years United States Rubber Company has been manufacturing electrical wires and cables. Today, the range of these "U. S." products contains the answer to almost any wiring problem you may meet.

U. S. Rubber pioneered in developing Laytex® insulation made of 90% pure natural unmilled grainless rubber. From U. S. Royal Cables, Royal Master Portable Cords and Grizzly Underground Cables to Uskorona corona-resistant cable, the U. S. Rubber line includes utility wires and cables of every description, including cables fitted to IMSA specifications for traffic, fire and police needs.


POWER HOUSES
Main Generator Leads, Motor Wiring (2300 volt), Control and Metering Wiring, Plant, Yard and Switchboard Wiring, Portable Cords and Intercommunication Wiring.
TRANSMISSION LINES
Leads for grounding lines during repairs.
STEP-DOWN SUBSTATION
Control, Switchboard and Building Wiring.
DISTRIBUTION SYSTEMS
For Overhead: Primary, Secondary and Street Lighting Cables, Plus Service Drop Cables and Telephone Drop Wiring. For Underground: Primary and Secondary Cables and Street Lighting Cables.
DISTRIBUTION SUBSTATION
Power Cables, Switchboard, Supervisory and Building Wiring.
INTERMEDIATE TRANSMISSION LINE
Overhead Wiring and Underground Cables, Supervisory Cables (underground).
FIRE ALARM SYSTEMS
POLICE CALL SYSTEMS
Underground Communication Wires and Cables
COMMUNICATIONS CENTER
(Telephone, Fire and Police) Building Wiring, Plus Frame and Inside Telephone Wiring
STREET LIGHTING
TRAFFIC SIGNALS
Underground Power Wires and Cables
FACTORY
Building Wiring, Time and Signal Systems, Portable Cords and Intercommunication Wiring.

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

U.S.RUBBER
SERVING THROUGH SCIENCE

Improved....

Series 63300 B

FISHER-PIERCE

PHOTOELECTRIC CONTROL

FOR STREET LIGHTING

This new Fisher-Pierce Control is the result of long experience in design and manufacture, combined with practical experience of more than 600 electric utilities in more than 20,000 installations.

The new 63300 B Control is mechanically and electrically interchangeable with existing controls. The same dependable Fisher-Pierce circuit, consistently giving tube life of more than 20,000 hours, has been retained. Improved spacing and insulation provides increased protection against lightning damage . . . up to 2500 volts rms Hipot. Mechanical design has been altered to provide maximum simplicity for greater economy of servicing.

The FISHER-PIERCE Co., Inc.

82 PEARL STREET, SO. BRAINTREE, BOSTON 85, MASS.

any of which may be mounted at any distance from the other units.

A vernier rheostat may be connected if a fine adjustment is required.

Polyphase units from ¾ through 3 hp, and single-phase units through 1½ hp are available.

Baldor Electric Co, 4553 Duncan Ave, St. Louis 10, Mo.

MORE NEW PRODUCTS about which you should know

American Mat Corp, is marketing a new cord and rubber **safety matting** for use in front of machinery. . . . Harvey Hubbell Inc, Bridgeport 2, Conn., has introduced a new line of **connectors** which are self-locking and reportedly vibration proof. . . . The Miller Co, Meriden, Conn., is producing a new Convaire **fluorescent luminaire** for industrial lighting, using two 40-watt lamps.

Westinghouse Electric Corp, Pittsburgh 30, Pa., has announced a number of **improvements in the CSP transformer.** Improvements are said to make the transformer simpler, smaller, and easier to ship and service.

General Electric Co, Schenectady 5, N. Y. has redesigned its line of **single-phase Inductrols** in standard ratings of 9.6 kva to 24 kva. . . . The Rockwood Sprinkler Co, Worcester 5, Mass., has developed a new **fire sprinkling system head** which breaks up the water into a fog pattern to fill the area from ceiling to floor.

The Henry G. Dietz Co, 12-16 Astoria Boulevard, Long Island City 2, N. Y., has announced a vane type pressure **air flow switch** for use in forced air cooling of electronic equipment. . . . Industrial Products Co, Philadelphia 33, Pa., has announced a new **Life-Save Vest** for bridge and dock workers, ship builders, and others working above water.

Acromark Co, 509 Morrell St, Elizabeth 4, N. J., has developed a **numbering tool** for rods and shafts which uses ordinary straight line flat surface marking type. . . . United Lacquer Manufacturing Corp, 1001 West Elizabeth Ave, Linden, N. J., has introduced a new one-coat, **heat-resistant lacquer.**

THE TOUGHER THE JOB THE MORE WE CAN HELP

An outside viewpoint is often essential in a search for new ways of cost reduction, methods, management, organizational, or engineering problems.

Commonwealth specialists have a sound background in the various aspects of business operations. Valuable time of your executives may be saved by calling Commonwealth in on the job.

No matter whether the job is large or small, Commonwealth's ability may profit you.

Check the ways in which Commonwealth can contribute to the efficiency and economy of your organization. Write for booklet describing the many services available to you. Address: Commonwealth Services Inc., Department 43, 20 Pine Street, New York 5, N. Y.

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ABILITY · EXPERIENCE · RESOURCEFULNESS · RESULTS

WHAT THEY'RE SAYING
at industry meetings

Uncle Sam—Research Sponsor

Dean A. A. Potter, *Purdue University before the Society on the National Science Foundation.*

Government aid for basic research is essential! We have reached a stage of such complexity in scientific endeavor and cost of equipment for basic research is so great that universities and private research foundations have insufficient resources to go forward speedily in creating new knowledge.

In so far as industry is concerned, there is a limit to the amount it can spend for long range basic research projects. Many of the problems now confronting industry and the engineering profession cannot be solved without new basic engineering knowledge. . . of the mechanism of combustion, of the way chemicals may react together on surface contact, and in fields such as the mechanics of fluids, elasticity, electronics, and heat conduction.

Basic research, on a scale commensurate with the dominant position of the United States, is essential to protect the industrial and technical competence of our people.

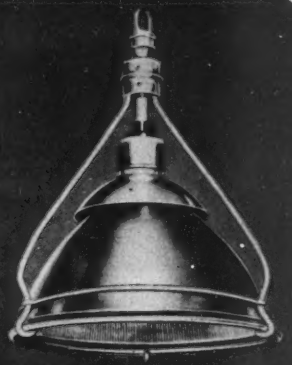
The Torch of Freedom

George M. Gadsby, *president of EEI and president of Utah Power & Light Company in opening the Public Utility Executive Development Program, University of Michigan.*

Government was never designed to operate a business! Measured by the standards of business principles, government has never been successful in its proprietary undertakings. The absurd understatement in preliminary estimates, the exorbitant construction costs, and the almost complete failure on the part of Federal projects to meet the rosy promises of financial return have amply demonstrated the inefficacy and inefficiency of the business ventures of Federal departments, commissions, and bureaus. This is confirmed by comparing the cost per kilowatt of government power ventures with those of the utility companies. It is borne out by the failure of TVA to return its costs to the

RECOMMENDED COMBINATION

For Lighting Heavy-Industry Plants



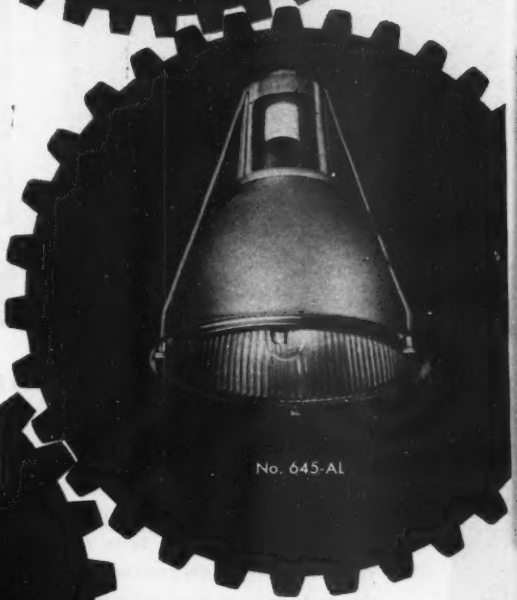
No. 693-AL-HS

HIGH BAY LIGHTING

HIBAY* lighting applies to mounting heights exceeding 25 feet and finds its primary use in Mills, Shops, Hangars, etc. Equipment is designed for 500, 750, 1000 and 1500 Watt Incandescent lamps as well as for the newer type 400 and 1000 Watt Mercury lamps. The prismatic reflectors give highest efficiency, and their smooth inner surfaces prevent permanent depreciation. Heavy-duty rugged construction guarantees safe, trouble-free operation.

LOW BAY LIGHTING

LOBAY* lighting with its variety of light distributions—concentrating, intensive and extensive—features prismatic reflectors for all kinds of light manufacturing. Designed with and without aluminum covers, these reflectors use Incandescent and Mercury lamps. The wide selection of light patterns produces highest illumination for any arrangement of machinery or equipment.



No. 645-AL

OUTDOOR LIGHTING

REFRACTOLENS* units, applicable for many outdoor uses, can be flushed in the wall or mounted on the surface. Their compound REFRACTOLENS, smooth on the inside surface with the prismatic optics sealed in an airtight chamber, give 180° lateral spread. Designed for Incandescent (100-1000 watt) and the 400 E-H1 Mercury, high illumination level is provided over large areas requiring wide spread of light.

No. U-850

Based on the economical operation of mercury in combination with incandescent lamps or mercury alone with incandescent stand-by, Holophane has developed HIBAY, LOBAY, and Outdoor Lighting Equipment designed for the severe conditions typical of steel mills and other heavy-industry plants. Twin and triple units are also available.

Holophane
Trade Mark

*Reg. U. S. Pat. Off.

HOLOPHANE COMPANY, INC.

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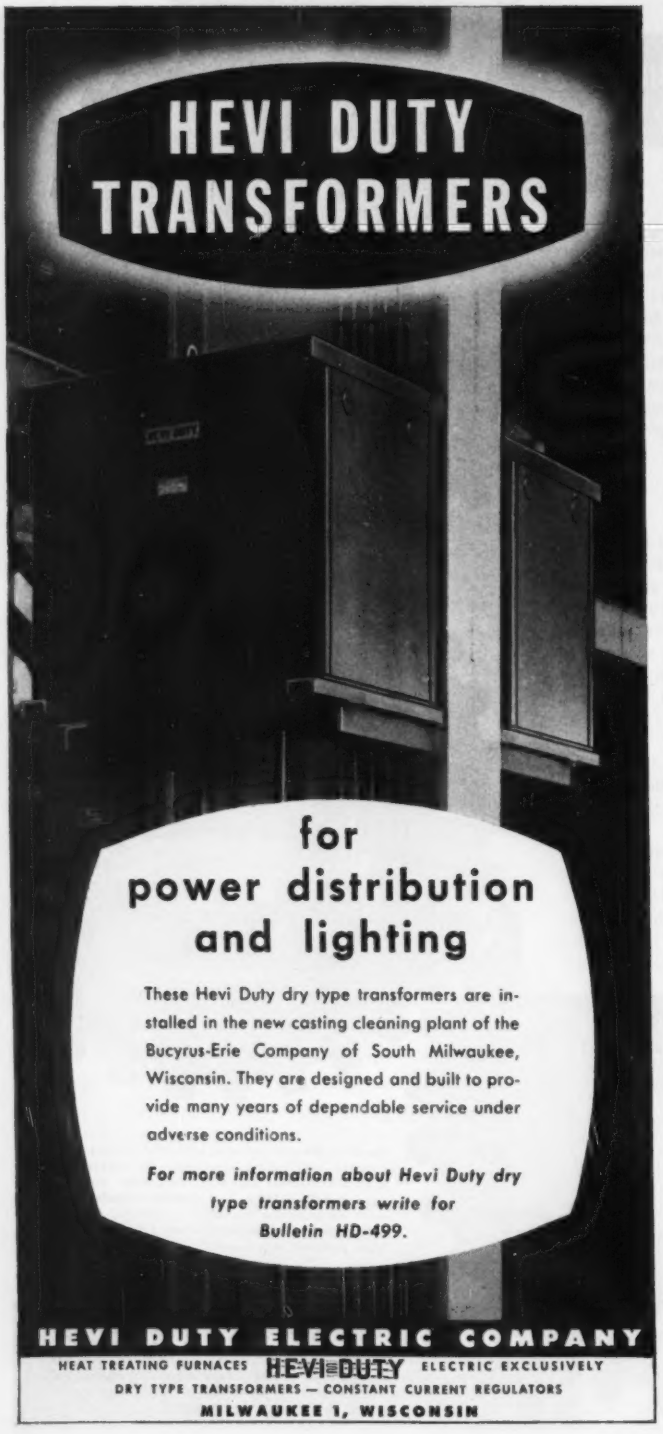
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO


HEVI DUTY
TRANSFORMERS
for
power distribution
and lighting
These Hevi Duty dry type transformers are installed in the new casting cleaning plant of the Bucyrus-Erie Company of South Milwaukee, Wisconsin. They are designed and built to provide many years of dependable service under adverse conditions.
For more information about Hevi Duty dry type transformers write for Bulletin HD-499.
HEVI DUTY ELECTRIC COMPANY
HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY
DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS
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United States Treasury and in lieu thereof its continuous drain upon the treasury. It has recently been shockingly demonstrated by the banking operations of the RFC.

Blame for this deplorable drift from the Founding Fathers deliniation of government in the Declaration of Independence and the Constitution . . . is found in mass public opinion, carefully nurtured by the group of men, in and out of government, who . . . have inculcated in our people . . . the willingness to accept Federal gratuities and subservience to bureaucratic controls and restrictions.

The generation of management in which I have lived has not been sufficiently successful in the task of preserving of freedom. You are now a part of management. . . Some of you will reach the top executive level of your organizations. A part of your responsibility will be to help change the 'direction of the wind of public opinion.' If you accept your responsibilities . . . you will succeed in repairing the breaches already made in the bulwark of a free people in a free nation—the rights and liberty of the individual!

The Future of Coal

John L. Lewis, *president of the United Mine Workers of America, before a group of German coal technicians touring the U. S. under the auspices of the Economic Cooperation Administration.*

"The oil, gas, and hydro-electric industries are not displacing coal as such. They are stopping coal from taking advantage of increasing demands for fuel values. We produced 500 million tons of bituminous last year and about 50 million tons of anthracite. Were it not for oil, gas, and hydro-electric energy we probably would have produced 750 to 800 million tons of coal. But the normal consumption of coal by the United States is greater now than at any time in its history."

Oil and gas cannot compete in cost in the generation of electric power in the big public utility plants, Lewis said. This industry is expanding at a rapid tempo. Modern installations, being built, are equipped with improved combustion facilities to derive more energy from coal. Technical progress in the usage of coal means that no other fuel can compete with it in these major power plants.

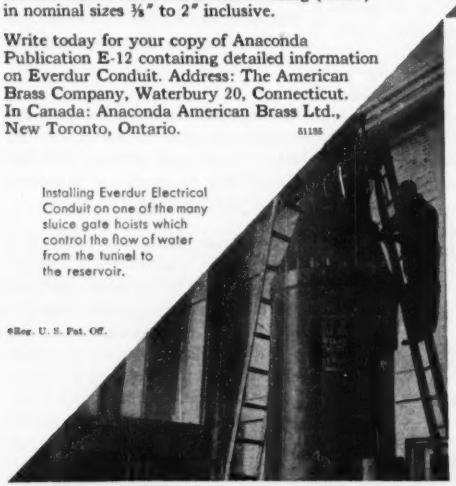
Everdur

protects the power for the world's biggest drink

For thirsty New York, the Delaware Aqueduct of the New York City Board of Water Supply performs a service that dares not fail. Hence, Everdur Electrical Conduit is used to protect feed wires for sluice gate motors, pump motors and recording instruments in corrosive locations. Thousands of feet of ¾″ and 1″ RC and EMT are in service at control stations and inspection elevators along the 117-mile tunnel. Junction boxes in important locations are also made of Everdur* . . . Anaconda's corrosion-resistant copper-silicon alloys.

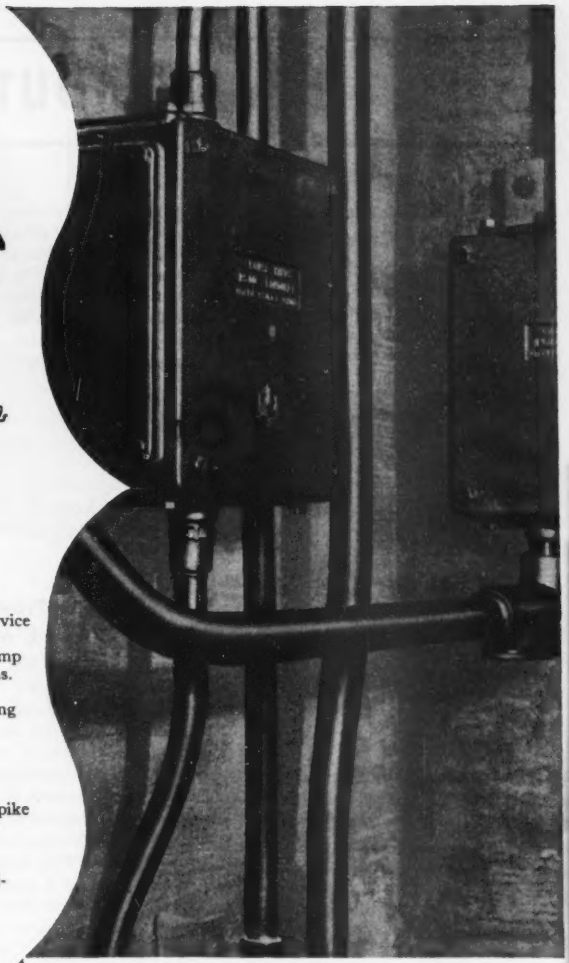
Everdur Conduit has performed impressively on the Delaware River Bridge and in the Pennsylvania Turnpike tunnels where, for many years, it has been exposed to highly corrosive conditions. Installations made since 1933 have shown that where ordinary conduit fails in months, Everdur Conduit lasts for years. It is available in two wall thicknesses: rigid conduit (RC) in nominal sizes from ¼″ to 4″ inclusive; and the thinner-walled electrical metallic tubing (EMT) in nominal sizes ⅜″ to 2″ inclusive.

Write today for your copy of Anaconda Publication E-12 containing detailed information on Everdur Conduit. Address: The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 81185



Installing Everdur Electrical Conduit on one of the many sluice gate hoists which control the flow of water from the tunnel to the reservoir.

*Reg. U. S. Pat. Off.



Everdur Conduit, 1″ RC and 3/4″ EMT in deep service shaft, Kensico Reservoir control station. Junction boxes are cast Everdur manufactured by Crouse-Hinds.

wherever corrosion resistance counts

consider **EVERDUR ELECTRICAL CONDUIT**

ANACONDA®

NEWS ABOUT PEOPLE

Union Electric Names Hough Chief Engineer

Eugene L. Hough, chief design engineer, has been made chief engineer of Union Electric Co of Missouri. He succeeds Stanley Stokes, vice president, who has been assigned as general supervisor of the company's activities in the joint project with Monsanto Chemical to study atomic power production.

E. L. HOUGH

Hough joined Union Electric in 1928 as an electrical engineer after six years of service with General Electric Co. He was named chief design engineer in 1943.

Stokes heads a group of three specialists from Union Electric who, with three experts from Monsanto, will conduct research on the feasibility of using atomic energy for the production of electric power.

Stokes began his utility career with Union Electric in 1912. He has served as assistant to the vice president, assistant to the president, and manager of outlying divisions. He became chief engineer in 1941 and vice president in 1950.

•

T. I. Phillips, vice president of Westinghouse Electric Corp and formerly in charge of the company's East Pittsburgh Divisions, has been assigned to the staff of the industrial products vice president. He will help plan the company's industrial products expansion program. A Westinghouse vice president since 1941, Phillips joined the company in 1915. **L. B. McCully** has been named general manager of the East Pittsburgh Divisions in addition to his present duties as manager of the Transportation and Generator Division.

William Webster, executive vice president of New England Electric System, has returned to his duties at Boston following 16 months' service as chairman of the Research Development Board of the Department of Defense, Washington.

•

Georgia Power Promotes Hammond, McCrorey

George Power Co has named two new officers. They are Edward C. Hammond as secretary and R. B. McCrorey as treasurer. Hammond replaces I. S. Mitchell, Jr, who has retired as vice president and treasurer, and McCrorey succeeds W. H. Wright, retiring vice president and secretary.

Hammond, who has been assistant secretary since 1950, joined Georgia Power in 1924 as a member of the purchasing and stores department. He later served in the accounting, operating, construction, and sales departments. He was appointed sales supervisor of the Athens division in 1941.

Starting with Georgia Power in 1926 as a clerk, McCrory has been head bookkeeper, chief clerk, supervisor of customer accounts, and assistant comptroller and assistant treasurer.

Mitchell, secretary of the Georgia utility since 1912 and vice president since 1944 has served the company for 54 years. He started as a bookkeeper. Wright joined the company in 1906 and became secretary six years later. He was elected a vice president in 1944.

•

Jarl A. Elmgren, has been elected treasurer of Public Service Co of New Hampshire. He had served as assistant treasurer since 1940.

Neal Named President of North Central Group

George A. Neal has been elected president of North Central Electrical Industries. He is president of Iowa Public Service Co.

Other new officers are J. B. French, vice president; J. A. Henning, treasurer, and John Lapham, secretary-manager.

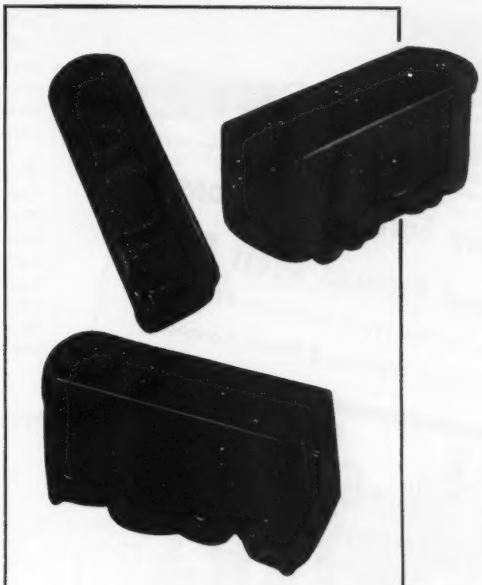
G. A. NEAL

Neal joined Iowa Public Service in 1925 and served as operating head of the company for ten years. Several years later he became president and general manager of Iowa Public Service and Sioux City Gas & Electric Co. The two companies have since merged.

•

Charles P. Jackson has been elected secretary of Alabama Power Co. He had been assistant secretary and succeeds **Walter M. Hood** who is retiring after 39 years with the company.

Vern L. Stone, assistant superintendent of generating stations for Commonwealth Edison Co, has been appointed superintendent. He succeeds **Dana D. Higgins** who has retired. Stone has served the utility in various capacities in the company's operating and engineering division since he joined Commonwealth in 1924. Higgins, started with the company in 1904 as an apprentice operator in the substation de-



THESE ARE PORCELAIN FUSE BOXES

These boxes are produced by casting—clay in its liquid slip form is poured into plaster molds and permitted to set. For the forming of complicated shapes, casting is among the oldest of ceramic processes. But only through relatively recent and intense development have the requirements of electrical duty been met.

For, without the requirements of electrical duty, the problem is much simpler. Distortion during firing could be avoided by stopping with partial vitrification. Internal cracks, introduced by shrinkage in porcelain produced by casting, caused no trouble if they couldn't be seen. Mechanical strength was seldom a problem.

But complete non-porosity, freedom from cracks, and mechanical ruggedness become of primary importance in electrical applications. Early attempts at casting of parts for electrical duty faced these problems. You may have seen heavy porcelain boxes, mistakenly specified in the belief that extra-thick sections would somehow cover up for defects in the porcelain.

Only when solutions were found for these problems at their source did Lapp begin producing porcelain by the casting method. Since 1936 we have been producing fuse boxes and other cast pieces in quantity demanded and in quality we sincerely represent to be of equal soundness and quality as all Lapp porcelain. Such porcelain is thoroughly vitrified—non-porous. It boasts a ruggedness achieved by a glaze-and-body fit engineered for maximum strength. It comes through without cracks or voids, so provides reliability mechanically, electrically and thermally.

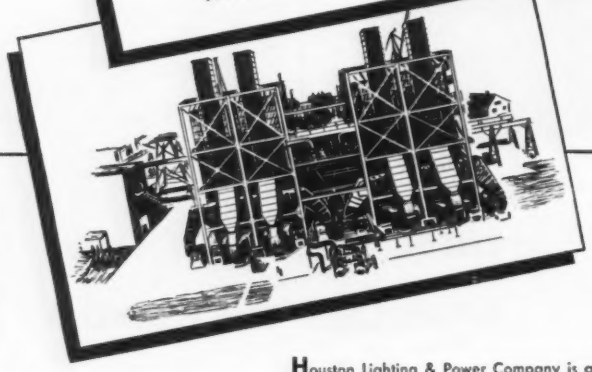
In porcelain parts for electrical equipment, as well as in insulators, there's an extra margin of security in porcelain by Lapp. Many manufacturers are willing to pay an extra price for Lapp quality, because of the manufacturing efficiencies and economies it affords them, and because of the extra performance it provides you. They know that—although *you can buy cheaper porcelain—you can't buy better porcelain*—than Lapp.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

GO on GREEN

4 Green Forced Draft Fans
4 Green Induced Draft Fans
. . . Serve the West Junction Plant of
Houston Lighting & Power Company



Houston Lighting & Power Company is a leading factor in the power field of the great southwest. That it approved the selection of Green Draft Fans by the boiler manufacturer — in this case Riley Stoker — is evidence of high acceptance in the field. No utility can afford to operate with inferior or unsuitable equipment at any point. It must have equipment that is not only highly efficient but right.

To Houston Lighting & Power can be added other well-known recently completed utilities that are Green Fan plants, among them the following:

Central Hudson Gas & Electric Co.
Atlantic City Electric Co.
Virginia Electric & Power Co.
Monongahela Power Co.
Louisiana Power Light Co.
Kansas Gas & Electric Co.
El Paso Natural Gas Co.
Pacific Gas & Electric Co.
South Carolina Public Service Authority
Buffalo Niagara Electric Corp.

With utilities as with industrial power plants, it's safe to "Go on Green" when it comes to draft fans.

Our Catalog No. 168 tells all about Green Fans. Write for a copy.

THE GREEN Fuel Economizer COMPANY INC.
BEACON 3, NEW YORK
ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

partment. He was chief electrician and then assistant chief engineer of the Northwest station, and later became assistant to the superintendent of generating stations. He was made superintendent in 1947.

W. Benton Harrison, Jr, has been elected treasurer of Sylvania Electric Products, Inc. Before joining Sylvania he served as treasurer of General Aniline & Film Corp for four years. He succeeds **Max F. Balcolm** who relinquished the treasureship to devote full time to his post of chairman of the board of directors.

•

Worthington Pump Elects A. H. Borchardt a VP

Worthington Pump & Machinery Corp has elected A. H. Borchardt a vice president.

In his new position Borchardt will have overall responsibility for the sale

A. H. BORCHARDT

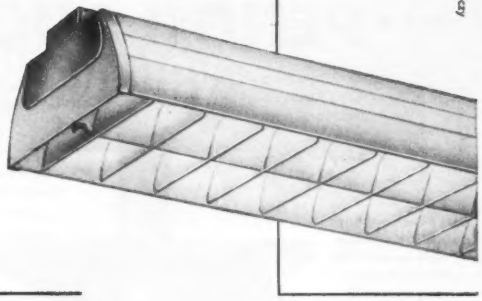
of the company's entire line of pumping equipment.

Starting in Worthington's erecting and testing department, Borchardt became successively draftsman, field engineer, and sales engineer. In 1921 he was made assistant manager of the centrifugal pump sales department, becoming its manager in 1929

Following this Borchardt served as sales manager at the Harrison plant, manager of the commercial engineering department, and in 1934 assistant vice president and manager of the centrifugal pump application and sales division.

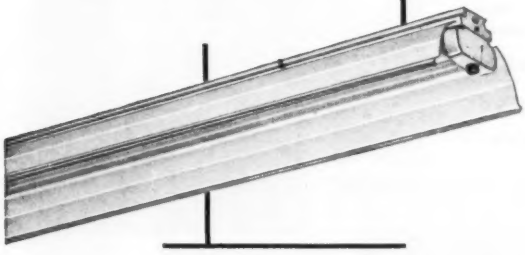
•

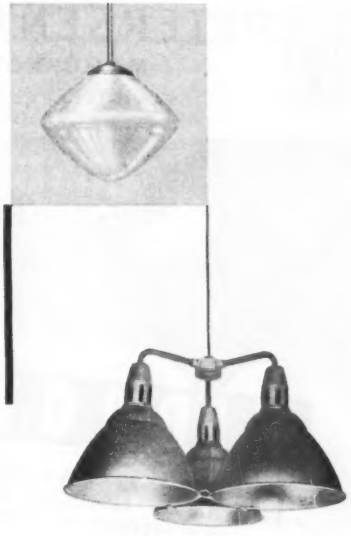
V. L. Dzwonczyk, illumination engineer and sponsor engineer in the electrical equipment section of American



Nardin & Radocay

ELEMENTS TO LOOK FOR IN MEASURING LIGHTING FIXTURE VALUES





First and foremost, QUALITY of equipment to assure good lighting performance and long service.

Then, engineering features that simplify installation and keep down to a minimum the cost of maintenance.

And—important economic consideration—low overall cost (cost of equipment, installation and maintenance).

These constitute VALUE—lighting satisfaction.

You'll find all these elements in Miller lighting equipment—Fluorescent, Incandescent, and Mercury-vapor—built on an 8-Point QUALITY standard, on a background of 107 years' pioneering and progress in GOOD LIGHTING.

Proven by thousands of installations in stores, offices, schools, factories and public buildings, covering a wide range of lighting requirements.

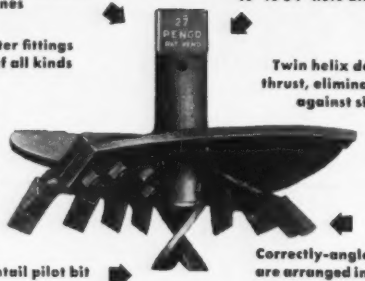
Light with confidence the *proven* Miller way. Miller field engineers and distributors are conveniently located for nation-wide service.

THE miller COMPANY MERIDEN, CONN.
SINCE 1844

ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment
HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices
ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

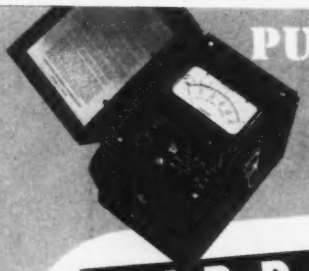
BORE Clean, True HOLES FASTER
in any soil, hardpan, decomposed rock, frozen ground and permafrost

WITH A PENGO AUGER


Available to fit all popular makes of earth boring machines
Made in 15 sizes from 10" to 54" hole diameter
Adapter fittings of all kinds
Twin helix design balances thrust, eliminates back-thrust against side of hole
Inexpensive wear-points are replaceable in the field without removing auger from the machine
Live-action fishtail pilot bit won't pivot on rocks
Correctly-angled cutting teeth are arranged in staggered pattern for fast cutting with minimum power

WHEN ORDERING, *specify make of machine auger is to fit.*
For detailed information, send for illustrated folder and price list **PL-3**

PETERSEN ENGINEERING CO.
MANUFACTURERS
SANTA CLARA, CALIFORNIA



PUSH BUTTON INSULATION RESISTANCE TESTING
with
VIBROTEST

• RANGES TO 50,000 MEGOHMS • NO CRANKING
• NO LEVELING • ALL-ELECTRIC • RUGGED
• FULLY PORTABLE • ACCURATE

VIBROTEST is built throughout to make insulation resistance testing FAST, EASY and ACCURATE for you. No laborious cranking . . . No mechanical parts to get out of order . . . Only two binding posts for ALL tests. Several Models have A.C. and D.C. volt ranges, as well as low resistance ohmmeter.

This is an instrument that makes insulation resistance testing a "push-button" affair! Ask for more information.

WRITE FOR BULLETIN 2-A

ASSOCIATED RESEARCH, Incorporated
"Precision Instruments Since 1930"
3760 WEST BELMONT AVENUE • CHICAGO 18, ILLINOIS

Gas & Electric Service Corp, has been appointed operating sponsor reporting to the operating vice president. He joined the company in 1938 and worked on major electrical apparatus, substation, and power plant problems until 1943 when he was granted a leave of absence to do research work. He returned to the company a year and a half later.

•

McRae Appointed VP of Bell Laboratories

A. B. Clark, vice president of Bell Telephone Laboratories, has been given a new post in which he will coordinate all Bell System programs at the Laboratories. Dr James W. McRae has been appointed vice president

DR J. W. McRAE

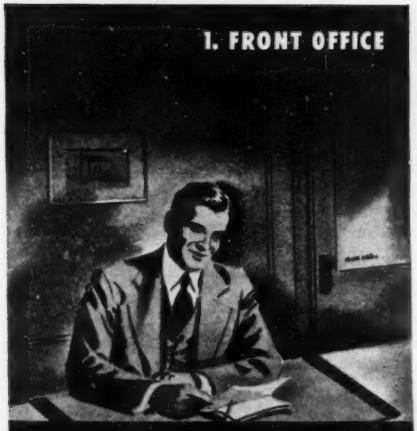
and succeeds Clark as head of the Systems Development organization. The Systems Development organization has been divided into three general departments: Systems Engineering, Transmission Development, and Switching Development.

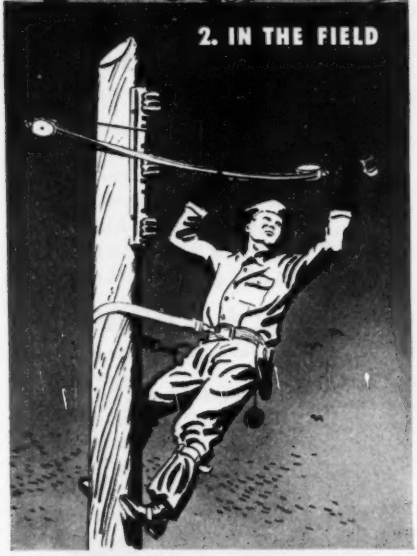
Heads of these departments are G. W. Gilman, Systems Engineering; G. N. Thayer, Transmission Development; and M. B. McDavitt, Switching Development. They will report to McRae.

Clark, a vice president of the Laboratories since 1944, began his career with Bell in 1911 when he joined American Telephone & Telegraph Co. From 1911 to 1934 he was a member of the Development and Research Department of A. T. & T. and joined Bell Laboratories when that department was consolidated with the Laboratories. He was named director of Transmission Development in 1935 and in 1940 became director of Systems Development.

McRae has been associated with the

TWO WAYS Reynolds ACSR SAVES You Money





1. COSTS LESS THAN OTHER TYPE CABLE

2. LIGHTER WEIGHT MEANS LOWER INSTALLATION COSTS

FRONT OFFICE can count their savings the moment they sign an order for Reynolds ACSR. Its first cost is considerably less than other types of cable . . . and aluminum's light weight adds further savings through lower transportation costs.

When Reynolds ACSR hits the field there's *more* good news. Aluminum's light weight makes for easier, faster stringing. Higher strength of ACSR permits a longer distance between poles—eliminating up to 4 poles per mile. Or, because the sag of ACSR is less than that for other types of cable, shorter poles or supporting towers can be used.

NOW . . . 4 Reynolds Master Reels do the work of 100 wooden reels! Handle ACSR quicker and more economically. Eliminate reel inventory and exchange. Cut down on handling, storing, record-keeping as well as reducing damage cost to a minimum. Reynolds Master Reels and Coils are easily assembled by linemen right on the job . . . are sturdier than wooden reels.

FREE . . . ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION CHARTS AND TABLES. Please request on your business letterhead.

For complete information

see your Reynolds distributors listed below or write direct to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.

Westinghouse Electric Supply Co., New York, New York (And branches) • North Coast Electric Co., Seattle, Washington • Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

Controlled HEAT FOR ALL TYPES OF SOLDERING

With 250-Watt WELLER GUN

No need to change tools for *light or heavy* soldering. The 250-watt Weller Soldering Gun does both with *controlled* dual heat. 5-second heating saves time and current on every job. Your Weller Gun pays for itself in a few months.

Check These Time-and-Money Saving Features

TRIGGER-SWITCH CONTROL—Governs heat for light or heavy work. Saves power because no need to unplug gun between jobs.

SOLDERLITE—Spotlights the work. Lets you see what you're doing at all times.

5-SECOND HEATING—No waiting, no wasted current. Saves hours and dollars each month.

LONGER REACH—Lets you get at any job with ease. Slides between wiring—into the tightest spots.

STREAMLINED—Compact and comfortable to hold. Pistol-balanced for fast precision soldering.

RIGID-TIP—Chisel-shaped. More soldering area for faster heat transfer. "Over-and-under" terminals give bracing action.

DUAL HEAT—Single heat 200 watts; dual heat 200/250 watts; 120 volts, 60 cycles.

See the new 250-watt Weller Soldering Gun today at your distributor—or write for bulletin direct.

SOLDERING GUIDE—Get your new copy of SOLDERING TIPS—revised, up-to-date and fully illustrated 20-page booklet of practical soldering suggestions. Price 10c at your distributor, or order direct.

WELLER ELECTRIC CORP.

817 Packer Street, Easton, Pa.

Laboratories since 1937. After service with the Signal Corps during World War II, he returned to Bell as director of radio projects and television research. He was made director of electronics and television research in 1947 and two years later was appointed assistant director of Apparatus Development and then director of that department. Since 1949 he has been director of Transmission Development.

•

De Laval Steam Turbine Elects Stewart Its Head

James P. Stewart, executive vice president of De Laval Steam Turbine Co, Trenton, N. J., has been elected president of the company.

Other executive promotions announced by the company include Wencel A. Neumann, Jr, vice president of industrial sales; H. G. Bauer, vice president of engineering; and Charles A. Jurgensen, vice president of manufacturing.

Stewart joined De Laval in 1946 and three years later was elected executive vice president. He is president of the Hydraulic Institute.

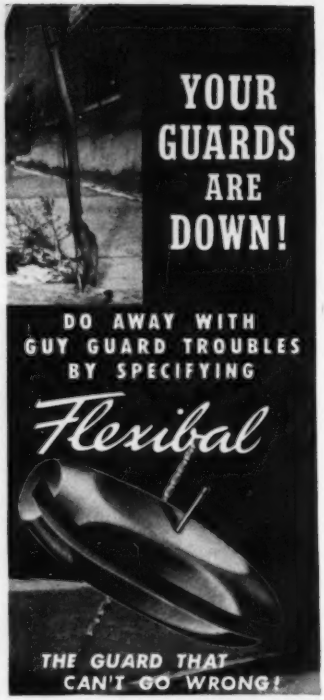
Also with De Laval since 1946, Neumann has been manager of the IMO-De Laval Products Division. In his new position he will be responsible for the industrial and commercial sales of the company's steam turbines, pumps, blowers and compressors, and power transmission equipment. Before joining De Laval, Neumann worked for Westinghouse Electric Corp.

Bauer started with De Laval in 1937 and has been associated with the marine activities of the company. He was named executive engineer in 1948 and a vice president a year later. He will continue as manager of marine sales.

Jurgensen, with the company since 1931, has been works manager since 1948. He will continue to serve in this capacity.

•

Robert E. Webb, personnel director, has been appointed to the newly created post of public relations director by Iowa Southern Utilities Co. The company also has named **John H. Waddell** technical assistant to the executive vice president. Webb has been with the utility for 25 years. Waddell formerly worked for Dela-



COSTS ⅓ LESS THAN METAL GUARDS—*AND YOU CAN FORGET THE MAINTENANCE PROBLEM*

No other type of guy guard is so easy to handle, so simple to install . . . none so effective in cutting down losses . . . never gets out of commission.

USED AND PRAISED BY CONSTANTLY GROWING LIST OF UTILITIES

R.E.A. APPROVED

Write for Free Sample and Prices

IMMEDIATE DELIVERY

TEN COMPLETE SETS IN THIS ONE LIGHT EASY TO HANDLE CARTON

SEE YOUR JOBBER OR WRITE TO

S. E. OVERTON COMPANY

SOUTH HAVEN, MICHIGAN

PEMCO

LIGHTS THE WAY

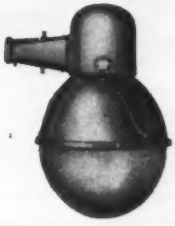
With This Quality Line of Luminaires

Modern lighting makes the difference . . . and whether it is Street Lighting, Flood or Spot Lights, PEMCO Products are way ahead on four major points: Quality, modern design, distinctive finish and economy.

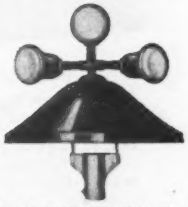
Illustrated are a few of the wide range of PEMCO products. Backed by 69 years of Street Lighting Manufacturing and "know-how" PEMCO today is a leader in the field.

Union Metal Poles—Easy to install, require little maintenance. Available with PEMCO Luminaires, making an ideal combination and complete package.

PEMCO-SYLVANIA —Unique in that lamp and reflector are one unit. Low maintenance expense. A new reflector is supplied intact with each new lamp.



PEMCO Modern Aizak Street and Highway Luminaires—for multiple or series circuits up to 5000 volts. For internal or external wiring.



PEMCO SERVICE STATION LIGHTING —Ruggedly constructed Island Luminaire available with from one to five Flood or Spot Lights mounted on top.

STREET LIGHTING LUMINAIRES— with deep asymmetric aluminum reflector. One of many styles. Aluminum hood tapped 1¼".

PEMCO FLOODLIGHTS— Aluminum with PEMCO "Aluminous Process" 18" dia. reflector. Clear, heat-resisting glass lens.

PEMCO FLOOD OR SPOT LIGHTING —Using PAR-38 or R-40 Reflector Flood Lamps. Cover plate for 4" conduit outlet box, or for wall mounting. Red, Green, Blue or special colors.

Catalog #90 will give you full details and specifications covering PEMCO's complete line of lighting fixtures, as well as engineering tips. To obtain your copy, attach coupon to your business letterhead and mail today.

PHILADELPHIA ELECTRICAL & MFG. CO.
1200-36 N. 31st St., Phila. 21, Pa.

Please send copy of PEMCO General Catalog No. 90 to:

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POSITION .....

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PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

ware Power & Light Co as superintendent of the transmission and distribution department.

Karel van Gessel has been appointed co-ordinator of foreign manufacturing affiliates by Sylvania Electric Products, Inc.

•

GE Sets Up 2 Divisions in Knolls Atom Power Lab

General Electric Co has established a technical division and an operating division in the Knolls Atomic Power Laboratory near Schenectady, N. Y. Dr Kenneth H. Kingdon has been named manager of the Technical division and William H. Milton, Jr, manager of the operating division.

The technical division will be responsible for fundamental and applied research functions of the laboratory. The operating division will be responsible for engineering, manufacturing, legal, and financial functions.

•

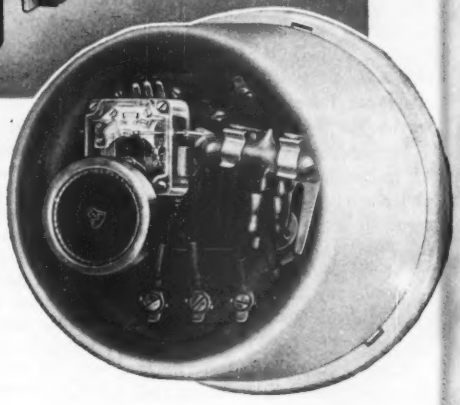
Charles L. Derrick, superintendent of engineering and assistant to the operating vice president of Hartford (Conn.) Electric Light Co, has been appointed assistant vice president. He came to Hartford in 1942 as assistant engineer after serving 19 years in engineering posts with Public Service Electric & Gas Co, Newark. **Kenneth L. Partridge,** assistant superintendent of engineering, has been appointed superintendent.

Earl Ewald has been appointed manager of electric operations for Northern States Power Co replacing H. H. Watson, who recently was made a vice president. **T. L. Jarchow** succeeds Ewald as general superintendent of distribution. In another change the company named **M. T. Jamieson** general superintendent of the Minneapolis division. Jarchow formerly was traveling engineer for the company and Jamieson superintendent of electric distribution for Minneapolis.

Col Chester K. Harding has been appointed South Atlantic District Engineer at Atlanta, Ga., for the Army Corps of Engineers. He succeeds **Col B. L. Robinson,** recently appointed Engineer Commissioner of the District of Columbia. An officer in the corps since 1918, Harding has served as assistant to the district engineer in New Orleans, assistant to the district

Bare Simplicity...

Hermetically sealed lifetime WESTON photo cell.
Long-life sealed Mercury Switch.
Positive acting WESTON Sensitrol® magnetic contact relay.
Simple 1 RPM synchronous motor.
Extremely heavy limit switch.



WESTON *(automatic, plug-in type)* Illumination Control

- No vacuum tubes, phototubes, resistors or capacitors used.
- Draws current only during operating cycle (about 1 minute per day).
- Employs only 5 components, less than a dozen soldered connections. (See above)
- One unit controls 3,000 or 6,000 watts, at 120 volts a-c.
- Extreme circuit simplicity, and rugged components, assure dependability and trouble-free service.
- Mounted in standard weatherproof watt-hour meter case.

WESTON
Instruments

For full details, 'phone your local WESTON Representative, or return coupon.

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Please send information on the new plug-in Illumination Control, Model 1089.

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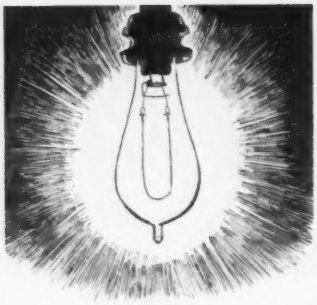


Flat rate from dusk till dawn

... 33 cents per month

When the first hydroelectric plant for incandescent lamps opened on September 30, 1882 at Appleton, Wisconsin, current was unmetered. Customers were charged on a lamp basis regardless of the hours of use. Original customers paid about 33 cents per lamp per month and service was from dusk to dawn.

The plant's waterwheel measured 42 inches in diameter, operated under a ten-foot head, and had a speed of 72 rpm. Two Edison "K" dynamos were used, each with a rating of 12½ kilowatts. There were no voltage regulators and operators depended on their eyes to gauge the brightness of the lamps.

Hemingray already had twelve years' experience in designing and manufacturing pole-line insulators when this plant opened. Continuously since that time the name Hemingray has been synonymous with quality and progress in glass insulator manufacture. Constant research and testing, careful quality control and thorough individual inspection assure uniform excellence.

HEMINGRAY
POWER INSULATORS
AMERICAN STRUCTURAL PRODUCTS COMPANY
Muncie, Indiana

Subsidiary of Owens-Illinois Glass Company

F. C. Wilson, Vidalia district manager of Georgia Power Co, has been named Brunswick district manager. He replaces **J. M. Armstrong** who has retired after almost 50 years' service with Georgia Power and its predecessor company. Wilson has been manager at Vidalia since 1929 and previously served as district manager at Carrollton and McDonough. Armstrong came to Brunswick in 1902 as superintendent of the Mutual Light & Water Co. He became manager at Brunswick when the company was merged with Georgia Power.

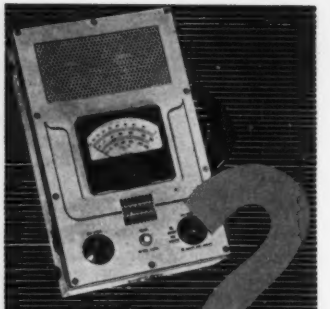
E. Charles Mueller, Jr, director of advertising and publicity for Arizona Edison Co at Phoenix for the past two years, has been named public relations director for Indiana & Michigan Electric Co, Fort Wayne, Ind. **Warren W. Widenhofer** has been appointed assistant public relations director, having previously served as advertising manager of the company's Fort Wayne division.

Bryan Gouger, superintendent of power production for the San Antonio, Tex., City Public Service Board, has been named purchasing agent. He replaces **Howard Henson** who has retired. Henson was the oldest employee of the city board and its predecessor, San Antonio Public Service Co. He joined San Antonio Gas & Electric Co in 1902. Gouger has been with the city board and San Antonio Public Service Co since 1921.

Harold S. Roberts, formerly chief engineer of the generating plant of Lawrence (Mass.)) Gas & Electric Co, has been appointed chief engineer of the New England Electric System's steam plant under construction at Salem Harbor.

F. G. Mayer, manager of Northern States Power Co's Stillwater division, has been named sales manager of the company's St. Paul division. He replaces **Fred C. Hoffman** who has retired.

Albert Ames, Seattle City Light industrial sales engineer, has retired after 34 years of service with the department. Starting as a salesman with City Light in 1917, he became senior engineer in San Francisco, and for the last four years has been professor of military science and tactics at the Missouri School of Mines.



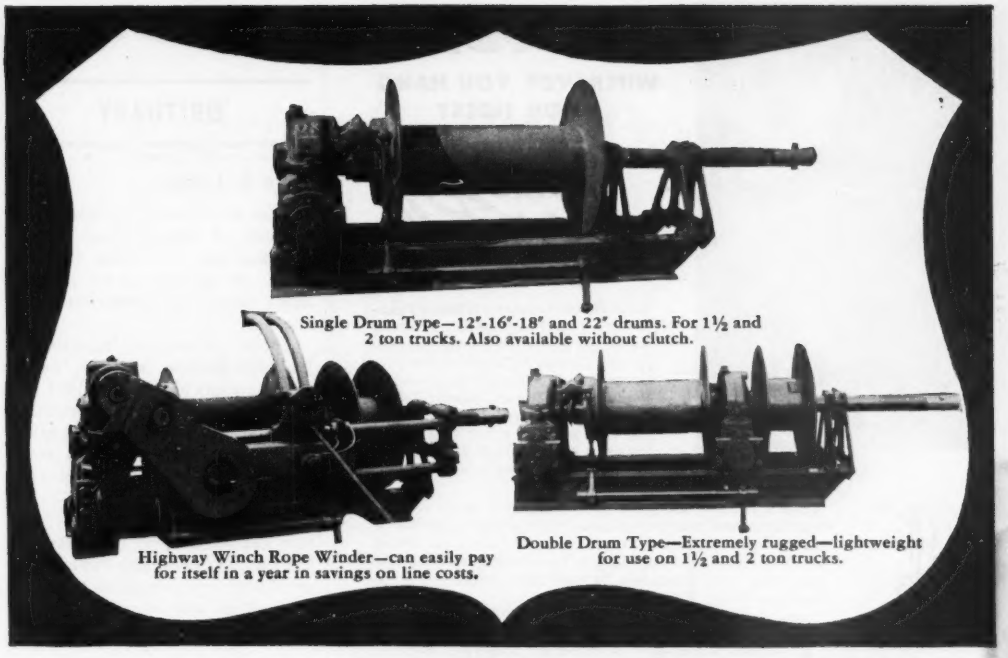
DON'T GUESS ABOUT WIRING!

SPRAGUE'S NEW
ADEQUATE WIRING ANALYZER

- Makes it quick, simple and easy to check existing wiring to see if it will safely carry proposed loads or if it is adequate for present loads. An effective visual convincer for your customers!
- Reads percent voltage drop under load directly on 115 or 230 volt circuits. Has direct-reading voltmeter for 115 and 230 volt lines.
- Furnished complete with connectors for convenience outlets, electric ranges, panel boards, etc.

Write for Bulletin PF-600

SPRAGUE ELECTRIC COMPANY
North Adams, Mass.



Single Drum Type—12"-16"-18" and 22" drums. For 1½ and 2 ton trucks. Also available without clutch.

Highway Winch Rope Winder—can easily pay for itself in a year in savings on line costs.

Double Drum Type—Extremely rugged—lightweight for use on 1½ and 2 ton trucks.

THEY'VE GOT WHAT IT TAKES

for safety and dependability

It's the men on the line who have given Highway winches and power take-offs their reputation as the standard of the field. Operators' safety is cared for so thoroughly, and the ease and dependability of operation so proved, that this preference is bound to result. This equipment is Highway-designed and Highway-built in our own shops, where we can control its precision and quality. That's why Highway equipment always returns such high dividends on your investment.

Power Take-Offs

Highway Propeller Shaft Power Take-Offs provide the most efficient type of winch drive. Wholly made to high precision standards in Highway's own shops. Single and dual drive models, both take full torque of engine motor and use all speeds of truck transmission.

HIGHWAY TRAILER COMPANY • Headquarters: Edgerton, Wisconsin

HIGHWAY

PLANTS AT
Edgerton, Wisconsin • Stoughton, Wisconsin
Cincinnati, Ohio

MANUFACTURERS OF
Public Utility Truck Bodies • Earth Boring Machines
Pole and Cable Reel Trailers • Winches
Power Take-Offs • Service Accessories • Commercial Trailers, Trailerized Tanks and Truck Tanks

DESIGNED, BUILT, SERVICED — *"Always a little better"*

economy

WHEREVER YOU HANG YOUR HOIST

with

COFFING Safety-Pulls

To save unnecessary labor, to protect men and equipment is sound economy. That's why wise foremen specify Coffing Safety-Pull Ratchet Lever Hoists. Whether for lowering conduit (as shown), raising heavy transformers, stretching guys or any of countless other jobs, these powerful tools provide tireless lifting, holding, pulling wherever used — letting one man replace a crew.

Special ratchet and pawl cannot slip, yet chain is free-wheeling when not under load. Nine sizes to fit every requirement. Capacities from 3/4 to 15 tons — all tested at 100 percent overload. Find out how Coffing Safety-Pulls can bring added economy to your operations. Write for Bulletin E8SP.

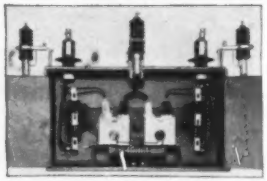
Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Spur-Geared Hoists • Differential Chain Hoists • Load Binders • I-Beam Trolleys

COFFING HOIST COMPANY
Danville, Illinois

SUPERIOR SWITCHBOARD AND DEVICES • SERVING THE COUNTRY'S LEADING UTILITIES •

Check with Superior on

"IT" Enclosures



Full range of sizes in standard and top bushing types —all built to Superior's usual high quality. Write to:

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company

tract agent in 1934. He has been industrial sales engineer since 1943.

OBITUARY

John E. Lynch

John E. Lynch, 75, retired vice president of Hartford Electric Light Co, died Aug. 2 at West Hartford, Conn. At the time of his death he was a director of Connecticut Power Co.

Lynch, elected vice president of Hartford Electric in 1929, started with the utility as a clerk in 1897 and became a supervisor the following year. In 1909 he was named secretary. He was made assistant treasurer of Connecticut Power Co in 1922 and treasurer in 1923.

In 1924 Lynch was elected treasurer and secretary of both Hartford Electric and Connecticut Power. Four years later he was appointed to similar positions with Manchester Power Co.

•

Walter P. Holcombe

Walter P. Holcombe, 76, retired vice president of the former Brooklyn Edison Co, died Aug. 1 at Babson Park, Fla.

He joined Brooklyn Edison Co in 1920 as a purchasing agent and six years later was made vice president in charge of purchasing and transportation. Holcombe retired from the company in 1942.

Before coming to Brooklyn Edison, Holcombe worked for Mobile (Ala.) Electric Co and then Wesco Supply Co, St. Louis.

•

Mae B. Woods

Mae B. Woods, 49, secretary of Edison Electric Institute, died Aug. 4 at New York after an illness of nearly a year. She had been on leave of absence from EEI since last fall.

Miss Woods had been active in the work of the institute, and its predecessor, the National Electric Light Association, for 29 years. She joined NELA in 1922 and became assistant to the secretary in 1929. When EEI was formed in 1933 Miss Woods was named acting secretary. The following year she was appointed secretary.

Lighting for Peak Production

Entails { Efficient
Properly Designed
Durable
Safe } *Equipment*

CERTIFICATION

takes care of over 35-million items per year,

– providing identification of products made to standard specifications,

– providing incentive to these manufacturers to improve design and quality.

ETL TEST REPORTS MAY BE OBTAINED FROM MAKERS OF VARIOUS OTHER ACCESSORIES

Know ETL by Test

ELECTRICAL TESTING LABORATORIES, Inc.

2 EAST END AVENUE *at* 79th STREET, NEW YORK 21, N. Y.

A booklet describing the Certification Service will be sent on application.

MANUFACTURERS and MARKETS

HIGH-VOLTAGE LIGHTNING ARRESTER developed by Westinghouse Electric Corp sends lightning down and around a "spiral staircase" to keep it from damaging equipment at power stations. It is half as tall as former high-voltage arresters eliminating need for large structural steel supports. Lightning is carried groundward by insulated conductors which angle between three vertical columns

Westinghouse Net Sales Set Record in 1st Half

Westinghouse Electric Corp's sales during the first half of this year totaled $590,562,000, setting a new record. The company's previous highest half-year sales record was $558,192,000 in the last half of 1950.

The net sales billed in the first six months of 1951 compares with sales of $461,731,000 in the corresponding period of 1950. Second quarter sales this year were $300,155,000—a record for any quarter—compared with $237,797,000 a year ago.

Net income for the first half of 1951 topped the total for the first half of 1950 despite higher federal taxes. The figure for the first six months of this year was $31,564,000, equal to $1.98 a common share, compared with $27,207,000, equal to $1.86 a common share, for the same period a year ago.

Earnings for the second quarter, however, dropped below the level for the second quarter of 1950. The 1951 second quarter total of $14,871,000, equal to 93¢ a common share, compares with $15,316,000, equal to $1.05 a share, a year ago.

The company's federal tax bill more than doubled in the first six months of 1951. It totaled $44,964,000 as against $18,331,000 for the first half a year ago.

I. T. & T. Buys Coolerator

Coolerator Co, Duluth, Minn., has been purchased by International Telephone & Telegraph Corp from Gibson Refrigerator Co, Greenville, Mich. As a result of the purchase a complete line of refrigerators, home freezers, and electric ranges will be added to the products already manufactured by I. T. & T. subsidiaries.

MANUFACTURING BRIEFS

General Electric Co has laid off nearly 500 workers engaged in television receiver production at Electronics Park. Restrictions on the use of basic materials were blamed for the layoffs.

Seven 33,333-kva transformers being built by Westinghouse Electric Corp for installation in French substations will be two ft narrower and five ft taller than similar transformers used in U. S. installations. Narrow tunnel clearances in France and narrower railroad cars are responsible for the slenderized transformers.

Westinghouse Electric Corp is planning to enlarge its transformer division plant at Sharon, Pa., by about 20%. The company has purchased seven acres of land adjoining the present plant area.

Wagner Electric Corp, St. Louis, has purchased a 52-acre site near its main factory in northwest St. Louis on which it will construct a plant for the manufacture and processing of hydraulic brake fluid. The new building will contain 63,000 sq ft of floor space and is expected to be completed by the beginning of next year.

Hotpoint, Inc, is offering commercial electric cooking equipment dealers a "Visual Cast" sales education kit with presentation scripts, procedure manuals, and more than 100 colored slides. The slides show construction and operation details of cooking devices made by the company for hotels, schools, restaurants, hospitals, and industrial plants.

Sylvania Electric Products, Inc, recently celebrated the 50th anniversary of its founding. Dating back to July 31, 1901, the firm originally refilled burned out light bulbs. At that time the company had 15 employees. Today it employs more than 22,000 persons.

Here's Why VICTOR Guy Strains NEVER LET YOU DOWN!

THEY'RE STRONG! VICTOR'S de-airing process produces porcelain of maximum density and tensile strength.

THEY'RE MADE OF HIGHEST QUALITY WET PROCESS PORCELAIN designed and manufactured to give unequalled mechanical and dielectric characteristics.

THEY'RE INDIVIDUALLY INSPECTED at every point of manufacture, one of many reasons why VICTOR Guy Strains are famous for durability and long service!

THEY'RE QUALITY CONTROLLED! All shipments of flint, feldspar and clay used in VICTOR Guy Strains are stored in separate bins and tested for quality and uniformity before using.

SMOOTH, HARD GLAZE protects them against weathering and contamination—cuts maintenance and replacement costs.

VICTOR Guy Strains are better because our engineers, technicians and craftsmen have the "know-how" to make them better! Each one is made with the same high grade materials and careful workmanship as are VICTOR's famous high voltage insulators. That's why more and more power companies are specifying VICTOR Guy Strains—the standard of the industry.

VICTOR NO. 504 GUY STRAIN INSULATOR. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

Do You Know that...

VICTOR is one of the largest manufacturers of spools in the country? They, too, are made of genuine VICTOR wet process porcelain. Every one is made to close, rigid tolerances to fit perfectly the proper rack or clevis.

Specify

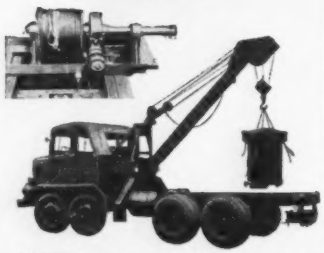
VICTOR

GUY STRAIN AND SPOOL INSULATORS

VICTOR INSULATORS, INC. VICTOR, N. Y.

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing-Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—*KRANE KAR* No. 70—*Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
2½, 5 AND 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
862 63rd ST., BROOKLYN 20, NEW YORK

General Radio Co, Cambridge, Mass., manufacturer of electronic equipment, has started construction of a new plant at Concord. The plant will be three stories high and will contain 72,000 sq ft.

More than 500 visitors were conducted through the plant of James R. Kearney Corp, St. Louis, manufacturer of electric power transmission equipment, on the occasion of the company's 25 anniversary July 23.

Employees of the Automatic Switch Co, Orange, N. J., recently presented Wilbur F. Hurlburt with a bronze testimonial plaque to commemorate his many years of service with the company. Hurlburt, president of Automatic Switch from 1929 to 1950, has retired from active service but will continue to serve as chairman of the board.

General Electric Co will build a $6 million electronic tube plant near Anniston, Ala. Work is expected to start shortly and the plant is scheduled for completion in the early part of 1952. The plant will provide work for more than 2,000 persons when in full operation.

SALES ASSIGNMENTS

COMPANY STAFFS

Rome Cable Corp, Rome, N. Y., has appointed E. T. Buchenmaier district sales manager in New York. Buchenmaier has been with Rome Cable since 1936 serving in the New York sales office.

Graybar Electric Co has named W. E. Guy Chicago district manager. Guy succeeds G. J. Cossman who has retired after 51 years' service. Associated with Graybar since 1924, Guy has been assistant district manager at Chicago.

General Electric Co has made Robert E. Jordan manager of its Electric Lamp Division's Niagara sales district. Jordan will make his headquarters at Buffalo, N. Y. The company also announced the establishment of a sales office for two-way radio and microwave equipment at 339 International Trade Mart, New Orleans. Merrill F. Chapin has been placed in charge.

Metal Prices
Aug. 6, 1951

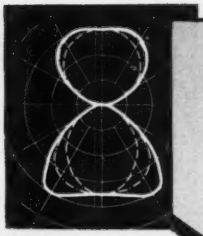
COPPER, Conn., Y, lb	$ .24½
LEAD, N. Y., lb	.17
ZINC, prime Western, E. St. Louis, lb	.17½
TIN, Straits, qual. N. Y., lb	1.03
ALUMINUM, ingot, base price	.19
NICKEL, base price	.59½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

WESTERN LARCH has many fine qualities that make it ideal for telephone and transmission pole use... high bending strength; high compressive strength; high shock resistance; unusual hardness; durability; long life and low service cost.

Western Larch is grown by J. Neils on virgin forest lands; produced and treated in the company's modern pole plant.

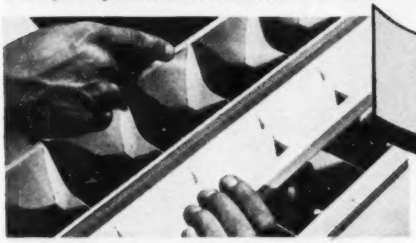
J. Neils Lumber Company, manufacturer of quality forest products since 1895, invites your inquiry on treated Western Larch poles. An illustrated folder about us, our pole facilities, and how we can serve your requirements, will be furnished on request.

POLE DIVISION
J. Neils
Lumber Company
J N
Libby, Montana



5 REASONS FOR CHOOSING LUVEX®

1. *Efficiency*—The famous Electrical Testing Laboratories report on LUVEX states an 83% efficiency rating, a remarkable engineering achievement for a shielded slimline fixture.

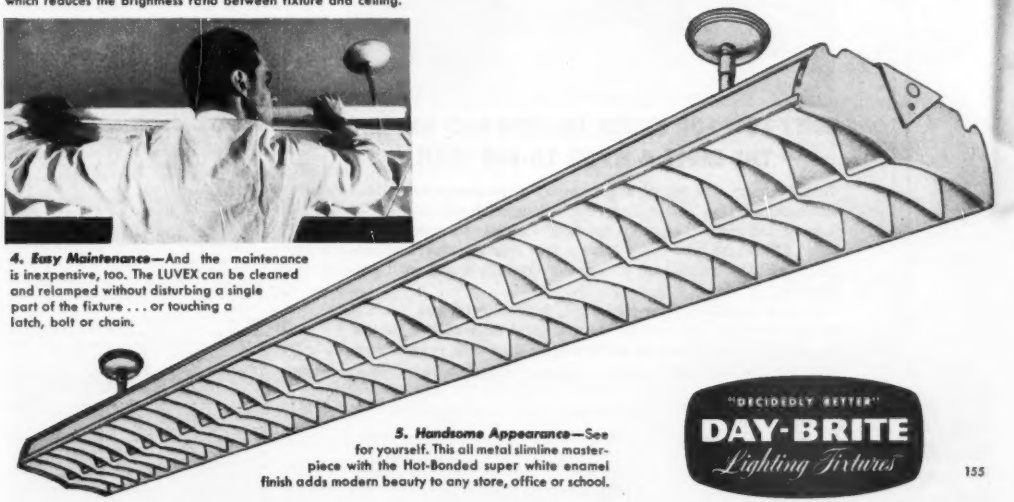


2. *Sturdy Construction*—The rugged truss-type chassis will not bend, sag or flex. The heavy gauge steel enclosure and louvers are completely interlocked for one piece rigidity and elimination of noise.

3. *Low Brightness*—The design of the fixture combines with the suspension mounting to provide a light distribution curve which reduces the brightness ratio between fixture and ceiling.

4. *Easy Maintenance*—And the maintenance is inexpensive, too. The LUVEX can be cleaned and relamped without disturbing a single part of the fixture . . . or touching a latch, bolt or chain.

Day-Brite's shielded-type slimline fixture. Luvex is engineered for two 40-watt fluorescent or 40, 60 and 75-watt slimline lamps. Recommended for suspension mounting only, it can be installed as single units or continuous runs. Why not get all the facts on LUVEX? Write today for full information. Day-Brite Lighting, Inc., 5417 Bulwer Ave., St. Louis, Mo. In Canada: Amalgamated Electric Corp., Toronto, Ontario. Distributed nationally by leading electrical wholesalers.



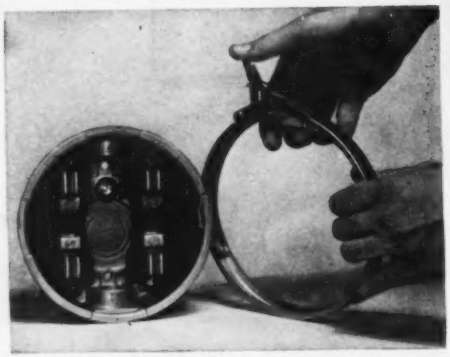
5. *Handsome Appearance*—See for yourself. This all metal slimline masterpiece with the Hot-Bonded super white enamel finish adds modern beauty to any store, office or school.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

155

QUICK AND EASY TO INSTALL

Standard Meter Sockets



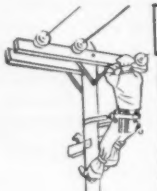
TYPE R FOUR-TERMINAL SOCKET covers almost all types of single-phase metering applications or ratings. It's easily mounted, has roomy space for wiring, also liberal current-carrying capacity.

QUICK-HITCH SEALING RING requires no tools for installation. With a simple snap of the ring, socket and meter are assembled. Socket with meter in place is sealed against the elements.

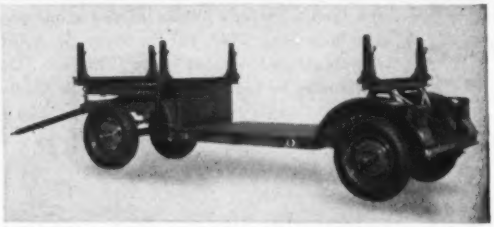
LESS MAINTENANCE, increased corrosion resistance, and longer life. Ask your G-E representative for full details or write for bulletin GEA-5147. Sec. 601-50, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

601-50



DESIGNED TO MEET YOUR NEEDS...in Line Construction and Maintenance



BUILT LOW FOR EASIER LOADING AND HAULING — THE EAGLE 4-WHEEL LO-BED TRAILER

Transformers and other heavy, bulky units are easy to load and carry on this trailer. Big, roomy, low platform. Also suited to pole and general purpose hauling. Full 90° turn with front dolly; 5th wheel type steer. Heavy duty construction; low center of gravity keeps load steady enroute. Equipped with pole bolsters.

5 tons capacity; over-all length, including tongue, 25 ft. 8 inches. Distance ground to low platform only 25-1/2 inches. Weight 5400 lbs. Equipped with electric brakes on rear wheels. Send for complete information on Model 6441—Eagle LO-BED Trailer.

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Division of
The Four Wheel Drive Auto Co.
APPLETON, WISCONSIN

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Eagle equipment is engineered by and for utility men expressly for their needs

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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt. Interior, P. O. Box 2511, Sacramento, Calif. furnish single circuit towers for Shasta-Keswick-Oroville 230 kv transmission line, Central Valley Proj., Spec. 200 S-166.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo. transformers and misc. electrical equipment for Gunnison and Salida substation, Colorado-Big Thompson Proj. Spec. 704S-199. L. N. McClellan, ch. engr.

Fla., Keystone Heights—Clay Electric Co-operative, Keystone Heights, electric power plant addns. E. P. McLean Eng. Co., 816 S. Main St., Moultrie, Ga., engr.

Ga., Rome—Georgia Power Co., 75 Marietta St. Atlanta, Ga., electric power plant on Cossa River. **$20,000,000.**

Ill., Chicago—City, City Hall, electrical imprvs., elevated lighting vaults, control equip. flood lighting towers and numerals, Chicago Midway Airport, $0.475-51-8, A-B-C-D; A-B-C-D-F, A-B-C-D-E-F. Plans deposit $100.

Md., Edgewood—U. S. Eng., 24 St. and Maryland Ave., P. O. Box 1715, Baltimore, Zone 3, radiological cold laboratory at Army Chemical Center, approx. 25 mi. northeast of Baltimore. ENG 18-020-52-2.

Mass., Braintree—Town, Electric Light Dpt., 44 Allen St., 2 story, brick, steel, concrete electric power plant addn., **$1,500,000,** Chas. T. Main, Inc., 80 Federal St., Boston, consult. engr.

Mass., West Concord—General Radio Co., 275 Massachusetts Ave., Cambridge, plant for electronic equip., **$725,000.** Certificate of Necessity granted.

Neb., Omaha—U. S. Cold Storage Co., 500 E. 3 St., Kansas City, Mo., 150x800 ft., 150 ft. high cold storage plant. **$2,500,000.** A. Epstein & Son Co., 2011 Pershing Rd., Chicago 9, Ill., engrs.

N. M., Los Alamos—B.A. 9/20—U. S. Atomic Energy Comn., Los Alamos, 2 story, bsmnt., monolithic type, 5,800 sq. ft. medical research laboratory, Inv. 291-52-7, **$1,700,000** to **$3,000,000.** Plans deposit $50.

N. M., Sacramento Peak—B.A. About 8/14—U. S. Eng., P. O Box 1538, Albuquerque, power transmission line (A51-1A). Serial No. Eng 29-005-52-3. Plans deposit $75.

Oregon—Bonneville Power Admin. 827 N. E. Oregon St., Portland, construct Forest Grove sub-station addns., Inv. 5995, Washington Co. Plans deposit $25. L. C. Stewart, c/o owner, engr.

Utah—Moon Lake Electric Assoc., Altamont, 65 mi. 69 kv rural distr. line, incl. poles, pole line hardware, conductors, cross arms, insulators, etc. from Rangeley to two Utah sub-stations at Jensen and Lapoint. **$300,000.** Louis Reese, c/o owner, mgr.

Wash., Wenatchee—Chelan Co. Public Utility Dist. c/o Stone & Webster Eng. Corp., engrs., 49 Federal St., Boston, Mass., main control switchboard of 12 panels to control 6 generators and 2 power transformers banks; 6 metal-clad cubicles for surge protective equip. and flyball transformers; 6 generator neutral circuit breaker cubicles for expansion of Rock Island Dam.

Wyoming—Bureau of Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., constr. Seminoe-Bairoil 34.5 kilovolt transmission line, Kendrick Proj. Spec. DC 3501. L. N. McClellan, ch. engr.

Wyoming—Bureau Reclamation, Dpt. Interior, Reclamation Center, Casper, Wyo., constr. Bairoil Sub-station, Kendrick Proj., Spec. 703C-206.

Wyoming—Bureau, Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing and del. f.o.b. cars at shipping point or f.o.b. cars at Lovell and Thermopolis, Wyo., control board, transmitter-receiver sets for Lovel Substation; carrier-current relays, and transmitter-receiver site for Thermopolis

Control Brush, Weeds and Grass with

DOW WEED KILLERS

Dow research supplies the answer to your problem of vegetation control on right-of-ways, around substations, pole yards, booster stations, and along fences. Dow's effective herbicides—used alone or in combination—enable your field crews to get their assignments done quickly at savings of from 25% to as high as 50% over laborious hand-cutting methods.

Dow sales and technical men are available for consultation to help you decrease clearing costs—simplify maintenance—and increase efficiency of power line patrols. Or we will gladly furnish you with a list of responsible service organizations engaged in the application of Dow Weed Killers for vegetation control. Write for information.

ESTERON BRUSH KILLER contains low volatility propylene glycol butyl ether esters of 2,4-D and 2,4,5-T. It controls woody and herbaceous plants including alder, ash, birch, cherry, elm, hickory, maple, oaks, osage orange, poison ivy, sumac, willow, and many other species. Also for treating stumps to prevent resprouting.

ESTERON 245 contains low volatility propylene glycol butyl ether esters of 2,4,5-T. It controls woody plants in the same manner as Esteron Brush Killer. Particularly effective on 2,4-D-resistant species such as brambles, hawthorn, mesquite, osage orange, palmetto, and poison ivy. Very effective for stump treatment and basal bark applications.

2-4 DOW WEED KILLER, FORMULA 40 controls a long list of annual and perennial weeds—where brush is not a problem.

SODIUM TCA 90% controls such grasses as Johnson, quack and Bermuda. Mixes readily with 2,4-D for weed and grass control in the same application.

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USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED, BRUSH AND GRASS KILLERS • INSECTICIDES
FUNGICIDES • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Basal Bark Spray with

Thompson's

Bramble-Weedicide

There's no "off-season" for controlling brush and tree growth with Thompson's Tested Bramble-Weedicide. Matter of fact, many utility men find Fall and Winter basal bark spraying more economical, more satisfactory than Summer foliage spraying.

Whether you spray by plane, truck or basal bark, it pays to use Thompson's Bramble-Weedicide. You get full strength — 2 pounds of 2,4-D and 2,4,5-T esters to the gallon — more killing units for your dollar. It is low volatile for utmost efficiency and low polarity for better penetration.

UTILITY MGR. WRITES

"Basal Bark Spraying has been tried with most promising results. It seems to be effective on all species, costs less to apply and can be used at any time of year."—*W. E. Adams, Manager, Macon Electric Co-op. Macon, Mo.*

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WEED & BRUSH KILLERS

- **WEEDICIDES:** 2,4-D Esters and Amines
- **BRAMBLECIDE** 2,4,5-T Low Volatile Ester
- **PHYTOCIDE** { General
- **PENTA-WEEDICIDE** { Weed Killers

substation Transmission Div., Missouri River Basin Proj. Spec. DS-3497. L. N. McClellan, ch. engr.

Alaska—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing two 25,000 hp. 600-rpm vertical-shaft hydraulic turbines for Eklutna Proj., Spec. DS-3506.

Alta., Penhold—D. W. Laird, engr., Defence Constr. Ltd., 400 Kensington Bldg., Winnipeg, Man., design, fabrication and installing 3 steam generating units. Approx. **$120,000.** Plans deposit $50.

Quebec—Dpt. Hydraulic Resources, Hon. J. S. Bourque, minister, (Prov. Govt.), Quebec City, Que., constr. power station at No. 2 Rapids, Upper Ottawa River, capable of generating 40,000 H.P. Approx. **$1,000,000.**

Low Bidders & Contracts Awarded

Ark., Batesville—Arkansas Power & Light Co., 123 W. 4 St., Little Rock, Ark., Owner Builds, $100,000, electric power line from Batesville to White Lime Co. Plant.

Ind., Madison—Turner Constr. Co., 420 Lexington Ave., New York, N. Y. CA Approx. **$1,500,000,** FACTORY. Westinghouse Electric Corp., 306 Pittsburgh 30, Pa.

La., Lafayette—Stone & Webster Engineering Corp., 49 Federal St., Boston, Mass. CA **$1,000,000,** design and construct electric generating PLANT. Gulf State Utilities Co. c/o contractor.

R. I., Westerly—Halloran Hollen & Riva, 1 Washington St., Providence, R. I., CA. **$1,250,000.** Generating PLANT with equip. connections, etc. Narragansett Electric Co., 49 Westminster St., Providence, R. I. Bids June 21.

Missouri—Miller Constr. Co., Vincennes, Ind. LB **$936,238.** 145 mi. rural distr. lines, 5 step-down distr., substations, starting at Palmyra and running thru Marion, Shelby, Randolph, Macon, Platte and Adair Counties, MISSOURI. Northeast Missouri Electric Power Co-operative, Palmyra, Mo. Bids July 12.

Ont., Scarborough—Carter Constr. Co., Ltd., 419 Cherry St., Toronto, Ont., CA **$2,500,000,** 2 story 160x450 ft., steel frame, rein.-con., ELECTRONICS BLDG. for Canadian Arsenals Ltd. Leaside. Defence Constr. Ltd., 441 Queens Quay W. Toronto, Ont. Bids June 26, awarded July 16.

Alaska, Anchorage—Morrison-Knudsen Co., Inc., 319 Broadway, Boise, Idaho, CA, **$2,763,000.** POWER and HEATING PLANT, for Alaska Railroad and Chugach Electric Coop. Assn., ANCHORAGE, ALASKA. Alaska Railroad, Dpt. Interior, Anchorage, Alaska. Bids June 15.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ill., Tuscola—National Petrol-Chemical Corp., Tuscola, plant to extract butane, propone, ethyl chloride from piped in natural gas company formed by Panhandle Easter Pipeline Co. and National Distillers Products Co. **$38,000,000**

Tenn, Cleveland—Bowater Paper Co., 250 Park Ave., New York, N. Y., steel, concrete pulp paper mfg. plant, covering 2,000 acres, **$45,000,000.**

W. Va., Point Pleasant—U. S. Eng., Madison Ave. and 8 St. West, Huntington, W. Va., ordnance plant for gun tubes to be operated by National Tube Co. (US. Steel) Frick Bldg., Pittsburgh, Pa., **$32,000,000.**

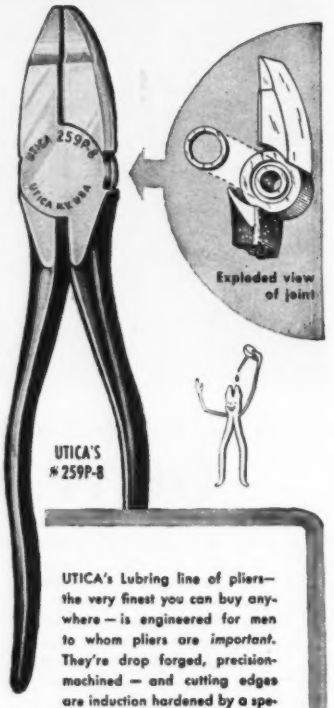
B. C., Castlegar—Celanese Corp. of America, Canadian Celanese Ltd., 207 W. Hastings St., Vancouver, B. C., pulp and paper mills. **$75,000,000**

Low Bidders & Contracts Awarded

Calif., Los Angeles—Robert E. McKee Inc., 4700 San Fernando Rd., West, Los Angeles, Calif., CA, **$8,261,160,** general contract Abbett Electric Co., 472 Tehama St., San Francisco, Calif., CA, **$1,180,437,** electrical work, MEDICAL CENTER. Bd. Regents, University of California, 405 Hilgard Ave., Los Angeles, Calif. Bids June 28.

Wash., Wenatchee—Westinghouse Electric Corp., Union Bank Bldg. Pittsburgh, Pa., CA, **$3,000,000,** electrical apparatus to be installed in new aluminum production plant. Aluminum Co. of America, 2156 Gulf Bldg., Pittsburgh 19, Pa.

PLIERS THAT OIL THEMSELVES!



UTICA's Lubring line of pliers—the very finest you can buy anywhere—is engineered for men to whom pliers are *important*. They're drop forged, precision-machined — and cutting edges are induction hardened by a special UTICA process.

Each UTICA "Lubring" pliers has a ring of porous iron floating in the joint. This ring serves as a tiny reservoir for oil and releases it to the joint *as it's needed*.

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THIS BOOK presents a compact, easy-to-read survey of the economic, sociological, and technical aspects of the integrated power system as a source of the adequate electric power so important in conserving our natural and human resources. It considers the economic advantages of the system, also analyzes the multitude of technical considerations involved, pointing up the coordination necessary to achieve the full results of which the integrated system is capable.

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As the Basic Mechanism for Power Supply

By PHILLIP SPORN

President, American Gas and Electric Company

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THE PRODUCT of 30 years of study and analysis, this book treats the integrated power system's position in the socio-economic structure in this country, emphasizing the importance of its future role. It discusses the advantages of the integrated system over a chain of power systems operated independently—from the viewpoint of savings in size of units and amount of reserve, lowered margins of insurance, utilization of the most economical sources of supply, and operation of all generating and load centers as a basic whole.

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- its technical bases
- importance of skilled coordinating personnel
- sources of power
- components and tools
- how it develops latent energy
- its social economic position
- and many other questions concerning various aspects of the integrated power system.

Even though it is not primarily a technical investigation, the book deals with the technical bases, components, and tools of the integrated system. Discussed are the generator, transmission, distribution systems; the tools which protect and regulate the system; and the role of skilled personnel in coordinating the system.

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CATALOGS • BULLETINS

● LARGE INDUCTION MOTORS: The large, polyphase induction motor, and where it fits into the industrial picture, is the subject of new 28-page booklet B-4739. A short summary of the type and features of two basic induction motors is presented. Applications are illustrated for a number of industries. Westinghouse Electric Corp, Box 3099, Pittsburgh 30, Pa.

● BLOCKS AND SHEAVES: A 24-page catalog (300-24), designed to make ordering of American Blocks & Sheaves a simple matter has been announced. Information includes block number, capacity, rope size, and weight of each block. American Hoist and Derrick Co, St. Paul 1, Minn.

● SPEED REDUCERS: Bulletin A-470 describing double reduction and bulletin A-602 describing single reduction Torque-Arm Reducers permit selection of the proper reducer for any installation. Dodge Mfg Corp, Mishawaka, Ind.

● SUBSTATIONS: Application of the CSP power transformer as a completely packaged, single feeder substation is described in a new booklet (B-4692). Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● CHROME PLATING: Bulletin 1C-20 describing the Chromaster Model A-20 Industrial Hard Chrome Plating unit may be obtained from Ward Leonard Electric Co, Mount Vernon, N, Y.

● FARM LIGHTING: Catalog 122-51 describing yardlights and laymolites in various sizes from 60 to 150-w is now available. Steber Mfg Co, Broadview, Ill.

● INSTRUMENT TRANSFORMERS: Technical data on GE indoor and outdoor potential transformers, current transformers, metering outfits, etc, is offered in the 1951 "Instrument Transformer Buyer's Guide." Listings of ratio and phase-angle tests, coupled with tables covering the mechanical and thermal limits of current transformers, have been included. General Electric Co, Schenectady 5, N. Y.

● COMBUSTION SAFEGUARD: "Protectoglo Combustion Safeguard for Industrial Gas-Fired and Oil-Fired Burners," Catalog 9601 provides comprehensive information on flame failure protection for industrial applications. Minneapolis-Honeywell Regulator Co, Wayne and Windrum Aves, Philadelphia 44, Pa.

● INSULATION TESTERS: The Midget Megger, the CVM Constant Voltage Tester, and the Midget Megger Circuit Testing Ohmmeter are described in bulletin 21-85-9. James G. Biddle Co, 1316 Arch St, Philadelphia, Pa.

● OIL AND WATER COOLER: A new design, featuring helically-finned heat transfer elements is described in bulletin 1020. Griscom-Russell Co, 285 Madison Ave, New York 17, N. Y.

● AIR SWITCHES: Outdoor Group-Operated Rotating-Insulator Vertical-Break Air Switches, 115 and 161-kv, 600 and 1600-amp are described in catalog 122. Pacific Electrical Mfg Corp, 5815 Third St, San Francisco 24, Calif.

● MOTORS: A 20-page booklet (B-4730) describing 600-Series mill motors and Class 9500 dc magnetic mill auxiliary controllers is available from Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● PRECIPITATORS: A catalog covering the latest design of the Series 342 Precipitator has recently been issued. This unit is designed to handle flyash, cinders, and industrial dusts. American Blower Corp, Detroit 32, Mich.

Widely used on

- Insulator Pins
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- Eliminate checking and re-tightening
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Every bolt-and-nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied—require little space—may be used on new or existing assemblies. Heavily galvanized by hot dip process to meet A.S.T.M. Specifications. Stocked by all leading pole line hardware manufacturers.

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TRANSFORMERS

STANDARD • SPECIAL

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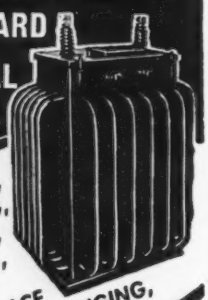

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CHAS. EISLER

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MOTION PICTURES

Films listed below are for 16 mm sound projectors and cannot be shown on silent equipment. Except as noted there is no charge for use but the borrower is usually expected to pay transportation charges one or both ways and insurance for loss or damage to the pictures.

Help Yourself Beat the Heat (12 Minutes)—An educational film, presented in color, which has proved to be a valuable aid in combating heat sickness in hot metal operations of Carnegie-Illinois Steel Corporation. Stressing good health habits, proper diet and use of salt and dextrose, this film is offered as an aid to those studying similar heat problems. Passed by the Committee on Medical Motion Pictures of the American College of Surgeons. United States Steel Corporation Subsidiaries, Pittsburgh 30, Pa.

Co-Ordinated Substations (10 minutes)—This film demonstrates that modern substations must be inherently reliable, compact, flexible, easy to maintain, and pleasing in appearance. This film describes how one company assumes responsibility for design, manufacture, and balanced integration of all the elements of co-ordinated substations. Included are substations of the single, two, and three or more feeder types.
Westinghouse Electric Corp 511 Wood St, P. O. Box 868 Pittsburgh 30, Pa.

The Davenport Story (22 minutes)—Practicality of aluminum building products is presented in filming of the step by step construction of Alcoa's new rolling mill at Davenport. Erection of this building utilized aluminum insulated paneling, sash, and conduit.
Aluminum Company of America, 818 Gulf Building, Pittsburgh 19, Pa.

Principles of Automatic Control (55 minutes)—Presents the subject of automatic control for instrument mechanics, operators, production supervisors, and other technical personnel. This color film may be shown by Instrument Society Sections and educational institutions without charge. Other societies $5, companies $10. Instrument Society of America 921 Ridge Ave, Pittsburgh 12, Pa.

Excursions in Science No 3 (11 minutes)—Two unusual phases of magnetism are presented in this picture. One story deals with the effect of strong magnets on weak magnets and explains the electron theory of magnetism. The second phase illustrates the effect of cold and heat on the Curie metal used in control devices with Alnico magnets.
General Electric Co, Schenectady, N. Y.

New Power for America (35 minutes)—The rapid postwar growth of utility capacity is illustrated in this color film by a series of scenes showing a number of new power stations in various stages of construction. These scenes are followed by the photographic chronicling of construction—from bare ground to finished project—of the Sewaren Station of the Public Service Electric and Gas Company of New Jersey. This film not only pictures the physical magnitude of postwar utility expansion but demonstrates the vastness of the program in terms of men, money and technical achievement.
Combustion Engineering—Superheater Inc, 200 Madison Ave, New York 16, N. Y.

Screw Drivers and Screw Jays (12 minutes)—Endorsed by the National Safety Council and other safety groups this film teaches highway safety by ridiculing the selfish heedless driver (screw driver) and the thoughtless jaywalker (screw jay). It was made to combat the bad traffic manners which cause accidents, and is narrated by Lew Lehr and Don Wilson.
Shell Oil Company 50 West 50 Street, New York 20, N. Y.

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BOOK REVIEWS

Scanning

Time Bases. **By O. S. Puckle. Published by John Wiley & Sons, Inc, New York 16. 387 pages, illustrated. Price $5.**

Users of cathode ray oscillographs will appreciate the thoroughness and comprehensiveness with which means are discussed for moving the fluorescent spot systematically across the screen. This second edition (first 1943) incorporates the intervening gains in linearity and in speed of traverse as well as precision in initiation of the trace.

Materials

Materials Handbook. **By George S. Brady, Published by McGraw-Hill Book Co., New York 18, N. Y. 913 pages. Price $8.50.**

The 9,000 materials described in the 6th edition (1947) have been increased in number and coverage but the convenient format is unchanged. All items are listed alphabetically and in addition there is an index to locate "buried" items and synonyms. Properties are given in qualitative and quantitative detail for each item and their significance is related to normal applications. In the extensive content of plastics as well as elsewhere, the author has taken pains to indicate trade names and identify them with respective producers. Included among the categories are the metals and their alloys, wood, textiles, abrasives, refractories, etc. With this book at hand purchasing agents can readily understand what substances their engineers and chemists want and why.

Meters

Maintenance and Servicing of Electrical Instruments. **By James Spencer. Published by The Instruments Publishing Co, Inc. Pittsburgh. 256 pages, illustrated. Price $3.**

This third edition is reported to carry the same text as the previous one but the illustrations have been brought up to date by substituting later models of instruments. The author was long in charge of the Westinghouse instrument, relay, and meter activities.

Instrumentation

Industrial Instrumentation. **By Donald P. Eckman. Published by John Wiley & Sons, Inc, New York 16, N. Y. 396 pages, illustrated. Price $5.**

This book reviews the principles of measurement methods employed in industrial processing and manufacturing. Emphasis is on method rather than mechanism. Important practical details are also supplied. Methods of applying instrumentation to processes are presented with the arrangement and selection of instruments and controllers, process analysis, and supervision of instrument equipment. Schematic diagrams of operation principles and meter installations are given.

Electronic Controls

Electronic Motor and Welder Controls. **By George M. Chute. Published by the McGraw-Hill Book Co, 330 West 42nd Street, New York 18, N. Y. 348 pages, illustrated. Price $6.50.**

Practical assistance to those who select, install, or service electronic controls for motors and resistance welders which can aid quicker and better job performance. It provides specific and detailed explanations of circuit operation of tube-operated equipment found in the two major groups of motor and resistance welding control. Improved electrical circuits with a variety of closed-cycle motor-control systems are given. Some of the topics covered are: basic welding controls, position controls, speed control of d-c motors, photoelectric register controls, and others.

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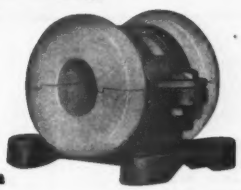

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Air Circuit Breakers—*Standards for Large Air Circuit Breakers,* publication SG3-1951, provides practical information concerning testing, rating, manufacturing, application and performance. They are generally used by the electrical industry to promote production economies and to assist users in the proper selection of circuit breakers. Available for $3.25 from National Electrical Manufacturers Association, 155 East 44 St, New York 17, N. Y.

Metering—*Standards for Metering Current Transformers for Primary Circuits* NEMA publication 106-1951 are issued by the AEIC-EEI-NEMA joint committee on instrument transformers for metering purposes. Copies are available from the National Electrical Manufacturers Association, 155 East 44 St, New York 17, N. Y.

Electric Fans—*Standards for Electric Fans* publication FMI-1951 provides practical information concerning the rating, manufacturing, performance, and testing of alternating- and direct-current electric fans. Available for $3.00 from the National Electrical Manufacturers Association, 155 East 44 St, New York 17, N. Y.

Pneumatic Standards—Adopted recently by the Joint Industry Conference on Pneumatics the *J. I. C. Pneumatic Standards for Industrial Equipment* is available free of charge from the Miller Motor Co, 4027 N. Kedzie Ave, Chicago 18, Ill.

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Function Plotting—Data sheet 10.0-5 describes the Electronik Function Plotter. This instrument automatically plots one variable in terms of another thus providing a continuous record of the relationship between two variables, showing one as a function of the other. Minneapolis Honeywell Regulator Co, Wayne and Windrim Aves, Philadelphia 44, Pa.

Indicating Instruments—*American Standard for Electrical Indicating Instruments* applies to panel, switch board, and portable and direct current instruments. Copies may be ordered for $1.60 from American Standards Association, 70 East 45 St, New York 17, N. Y.

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Mechanical Plant layout, process piping, conveyors, heating and ventilation, boiler houses, process equipment layout, refrigeration, plumbing, tanks and vessels, packaging equipment, special machinery and equipment.

Structural Structural steel and reinforced concrete.

Please submit complete resume stating experience, education, salary required and availability date.

THE H. K. FERGUSON COMPANY
Engineers and Builders

The Ferguson Bldg. 1783 E. 11th St. Cleveland 14, Ohio
19 Rector Street New York 6, N. Y.

MFG. REPRESENTATIVE

WANTED

for quick process metal stampings—10 days to 2 week delivery on all stampings.

Prefer sales engineer. We produce stampings for electrical, airplane, instrument, camera or any machine stampings in small or large quantities.

Good Commission.

Need representative in New York, Boston, Detroit, Los Angeles, and Houston.

RW-1545, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE

4 used Westinghouse Regulating Street Lighting Transformers

Primary voltage 2200 (with taps), 68KW, 60 cycle, 2 circuit, style #326332A. Price $350.00 each or 4 for $1200.00. For particulars write:

James B. Lewis, Supt. Municipal Electric Dept., City of Watertown, New York

SPECIAL ASSISTANT TO

GENERAL SALES MANAGER

Wisconsin manufacturer has excellent opportunity for sales executive. Must be experienced in traffic appliance sales, thoroughly conversant with all operating and policy phases of one or all three major national electrical distributors and qualified to correlate manufacturer's activities between all headquarters, district and branch offices on both contractor supplies and appliance items. Also supervise field sales forces' activities with these accounts on nation-wide basis. Please submit complete resume of previous experience and salary requirements. Write

P-1546, Electrical World
330 W. 42nd St., New York 18, N. Y.

SALES ENGINEERS

Opportunities available for young engineers interested in public utility field as assistants to Industrial Sales Engineers in maintaining constructive contact with commercial and industrial customers and promoting the use of gas and electric service through cooperation with planning, contractor and customer representatives in developing new and extended applications of gas and electric service for commercial and industrial purposes. Submit personal history with letter of application to:

Employee Relations Office
Central Hudson Gas & Electric Corp.
South Road
Poughkeepsie, New York

FOR SALE

2—G.E. Type IRS 120 KVA Induction Voltage Regulators

Outdoor. 2400 volt 1.000/500 ampere 5% or 10% buck or boost. Used 5 years. New Condition. Available now. For further information contact

L. K. THOMAS, Supt.
NEW LONDON, UTILITIES
New London, Wisconsin

MECHANICAL ENGINEER

Degree. Experienced in construction and plant lay-out to supervise the design of installation of large diesel engines. Requires knowledge of structures, foundations, cooling and ventilation systems. Also internal combustion engines, switchgear, etc. Middle West. Reply stating education, experience, salary desire.

P-1521, Electrical World
330 W. 42nd St., New York 18, N. Y.

FOR SALE

3—600 KW 750 KVA Diesel Electric Generator Sets (2—Ingersoll-Rand and 1—General Motors).

For further information address
SILAS MASON COMPANY
Pickstown, South Dakota

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
2— 400 KVA Pittsburgh, 1 Ph., 2400/4800-240/480 Scott-Taps
3— 400 KVA G.E., 1 Ph., 9900V 2300V Sec.
1— 200 KVA G.E., 3 Ph., 2400V 220 Sec.
1— 50 KVA G.E., 1 Ph., 2200V/5600V-220/440
1— 50 KVA G.E., 1 Ph., 13,456V, 120/240 Sec.
1— 25 KVA G.E., 1 Ph., 440/220, 220/110 Sec.

SYNCHRONOUS MOTORS

1— 300 H.P. Elec. Mach. 720 RPM, 3 Phase 60 cy., 2200V, Totally Enclosed Fan Cooled Outdoor Service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V, 514 RPM, 4000V Syn.
1— 200 KW Whse., 275V, 900 R.P.M., 220 V. Syn.
1— 175 KVA West., 1 Ph. 220V, Motor 3 Ph. 400V.
1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1— 100 KW, Allis-Chalmers, 125/250V, 900 R.P.M., 480V Sc.

SLIP RING MOTORS

1—2500 HP G.E., MT, 257 RPM, 6600V.
1— 250 HP West., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc.

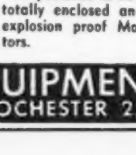
Large Stock of A.C. and D.C. Equipment

MOTORS, GENERATORS, TRANSFORMERS
1 – 1500 H.P.
Bought and Sold New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

WANTED TO BUY

For Cash

Electric Motors, AC
Electric Motors, DC
Motor generator sets
Transformers
Oil Circuit breakers
Control Equipment



We specialize in new totally enclosed and explosion proof Motors.

FOR SALE

New and Used

Gearhead motors
Explosion proof motors
Totally enclosed motors
Slip ring motors
Squirrel cage motors
Motor generator sets
DC motors

POWER EQUIPMENT COMPANY
8 Cairn Street, ROCHESTER 2, N.Y. P.O. Box 534

What is YOUR Problem?

Competent men for your staff? Employment?
Or, are you looking for — or offering — a business opportunity of special interest to men in the industry served by this publication?
The solution of any of these problems can logically be found *first* among *other* readers of Electrical World. You can get their attention—at small cost—through an advertisement in the Searchlight Section of

ELECTRICAL WORLD

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	7500	G.E.	138000-41000, 3 ph.
3	3333	West.	132000-7620/13200 Y
1	2000	G.E.	69300-13800/23900 Y, 3 ph.
3	1000	West.	66000-7200
3	500	G.E.	66000-2400
3	200	Mal.	44000/22000-440/220
3	75	G.E.	44000-2300/4600
3	8333	West.	43800-13900
6	150	G.E.	34500-4600/2300
2	7500	A.C.	33000-13200, 3 ph.
6	200	G.E.	33000-2300/6900
4	150	G.E.	33000-7200/12470
6	75	Mal.	33000/16500-2300/6900
3	75	Wag.	33000-7200/12470 Y
1	7500	G.E.	26400-612, Rectifier type
4	450	A.C.	25410/44000-13280/23000
3	333	G.E.	11000/22000-2400
3	200	Mal.	11000-2300
3	37½	Pitts.	6900-230/460
3	333	G.E.	4160-240/480
3	250	G.E.	4160-240/480
3	500	G.E.	4000-2300
3	200	A.C.	2400-120/240

INDUCTION REGULATORS

1—140 KVA G.E. 200 A. 4000 V. 3 ph.
3—46 KVA West. 200/400 A. 2300 V.
6—36 KVA G.E. 150 A. 2400 V.
2—36 KVA G.E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

4—600 A. 154 KV G.E. FHKO-39-2500 MVA
1—600 A. 132 KV G.E. FHKO-60-1500 MVA
2—600 A. 73 KV G.E. FHKO-139-1000 MVA
1—400 A. 73 KV G.E. FHKO-236-500 MVA
1—600 A. 37 KV G.E. FHKO-139-450 MVA
1—400 A. 37 KV G.E. FHKO-236-500 MVA
4—600 A. 15 KV G.E. FHKO-139-750 MVA

BREW, WOLTMAN & CO., INC.

52 Church Street New York 7, N. Y.

TRANSFORMERS
FOR SALE

1 Phase, 60 Cycle

3—400 KVA W-H 13200-600/575/550
3—333 KVA G-E 33000—2300/4000Y
3—250 KVA W-H 13800—2300
3—250 KVA Kuhl 6600—575
3—200 KVA G-E 13200—120/240
3—100 KVA G-E 33000—6900/11950Y
3— 75 KVA G-E 11500—230/460
3— 50 KVA G-E 33000—2400/4160Y
3— 50 KVA A-CH 33000—2400/4160Y

3-Phase, 60 Cycle

3— 750 KVA W-H 13800—460 Dry Type
1—4000 KVA W-H 15000/12750 Auto

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

Cincinnati 27, Ohio

NEW
Guaranteed Rebuilt
MOTORS-GENERATORS-CONTROLS
NOW IN STOCK
We buy surplus equipment
L.J. LAND Inc.
Box 756 Reading-5Pa

1—Evaporator—G. R. style R bent tube purchased 1937 shell 185 psi, heads and tubes 400 psi, 9000 lb./hr. capacity net. With safety valve and some fittings. Admiralty tubes 188 sq. ft. effective surface.

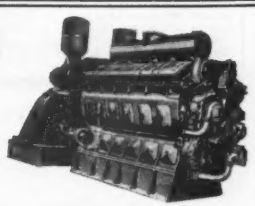
1—Boiler Feed Pump—Worthington turbine type centrifugal type W-1 Class BF 5 stage 5 inch horizontally split 797 gpm 1110 ft. TDH at .939 specific gravity. 1750 RPM complete with Westinghouse 400 HP—2300 volt—3 phase constant speed induction motor. Falk coupling, bedplate, no controls. Pump purchased 1929 motor 1945.

2—DeLaval Centrifugal Pumps—never used—model 2-IS—3/2A each single suction horizontally split 2 stage rated 50 gpm at 288 ft. head, 1750 RPM, with coupling, on bedplate.

For detailed additional information write to:

J. J. MORSE, *Purchasing Agent*
New Orleans Public Service Inc.
317 Baronne Street **New Orleans 9, Louisiana**

DIESEL POWER
FOR
IMMEDIATE SHIPMENT
UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	32F16	2000	300	375	Enterprise	D8G-6	450	450
1420	Fairbanks Morse	38D8⅛	1600	720	330	Superior	KNA	396	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
625	Alco	6-12½x13T	750	600	125	Ingersoll Rand	8	225	514
425	Baldwin	VO-6	510	453	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1	6000	Al. Ch.	Condensing 200/250 L.B.P. 2300 v. 3/60 Exc. & Surface Cond.
2	750	G.E.	Condensing — 425 lbs. 750 TT. L.B.P. 440v. 3 ph. 60 cy.— Built 1944
1	400	Westg.	Non-condensing — 125 150 lbs. L.B.P. 5, 10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1	300	G.E.	Non-condensing 150/175 L.B.P. & 10 B.P.—480 v. 3 ph. 60 cy

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5140	Whse.		2400/4160	900

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2	2000	G.E.	500	666.25 cy.	11000
1	1500	G.E.	720	600	12200
1	1500	G.E.	360	275	2200, 4400
1	1000	Whse.	900	600	4150
1	1000	G.E.	900	260	4100/6900
1	750	Whse.	900	275	2300/4150
2	500	Whse.	900	250	6600/13200
1	500	Whse.	1200	125/250	2300
1	500	G.E.	900	600	2300/4000
1	500	Whse.	900	250	440
1	500	G.E.	720	125	2300
1	400	G.E.	720	250	440/2300
1	350	G.E.	900	125	4150

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
2—4000	G.E.	HT	3	22000x2300
4—2500	Mal.	O15C	1	69000x13800
2—1250	G.E.	HVDDJ	1	69000x580
4—333	G.E.	HKDD	1	13800/6900x230/460
6—300	G.E.	HT	3	2400x240/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

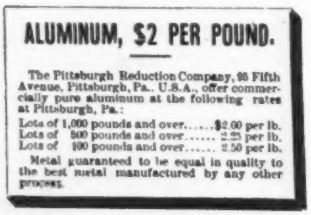
LETTERS TO THE EDITOR

An Early Advertisement

To the Editor

We have found a fragmentary record indicating that we paid to "Electrical Engineer" on October 31, 1890, $10.08 for advertising and again on November 29, 1890, the same amount.

I am much interested in getting a tear sheet or a photostat of those early ads which I think were among the first that our company ever ran. At that



ALUMINUM, $2 PER POUND.

The Pittsburgh Reduction Company, 98 Fifth Avenue, Pittsburgh, Pa., U.S.A., offer commercially pure aluminum at the following rates at Pittsburgh, Pa.:

Lots of 1,000 pounds and over.....$2.00 per lb.
Lots of 500 pounds and over..... 2.25 per lb.
Lots of 100 pounds and over..... 2.50 per lb.

Metal guaranteed to be equal in quality to the best metal manufactured by any other process.

time we were known as the Pittsburgh Reduction Company. If you can help me in any way, I will appreciate it very much.

Chester C. Conner
Assistant Secretary
Aluminum Company of America
Pittsburgh 19, Pa.

Editor's Note: The $10.08 amount covered weekly insertion of a one inch one column advertisement for a month. Electrical Engineer was subsequently merged with other publications into what is now Electrical World.

Didn't Blow Apart

To the Editor:

Exception is taken to your reference to the Smith-Putnam Wind Power Project on page 63 of your June 4, 1951, issue in which it is stated:

"Biggest problem of engineers working on the [wind power] tower [in Germany] is to avoid the mistakes of American engineers who put up a huge power mill in Vermont [which] produced 1,000 kw for three weeks and then blew apart."

The actual facts, necessarily briefly stated, are that after upward of two years intensive detailed study of the aerologic, aerodynamic, electrical, and mechanical considerations to be taken into account, accompanied by general and detailed design and actual construction and erection, the wind turbine was placed under test in August, 1941. In October, 1941, it was successfully phased in and furnished power for the Central Vermont Public Service electric system.

The unit was under intensive study and test for a period of 3½ years. The actual test operation was several times interrupted by mechanical troubles. Some shutdowns for alterations were necessary and some merely advantageous from long range considerations. The longest interruption to the test program was caused by failure of the main bearing and as this occurred during our active participation in World War II, considerable delay was experienced in obtaining a new one.

Functional studies never ceased but were carried on continuously for a period of 6 years, 1939 to 1945.

In the latter part of March, 1945, one of the blades failed at its connection to the hub structure. Damage to the rest of the equipment and to the structure was negligible.

By this time sufficient information and experience had been gained to design successful wind turbines and to select the most advantageous locations for them.

Economic factors had changed and worked against the financial success of new turbines at suitable locations and the project was reluctantly abandoned.

Interest in wind power was, and still is, world-wide. From many news items it is evident wind power projects are being considered at numerous locations throughout the world.

For a comprehensive account of the Smith-Putnam Wind Power Project, reference is made to "Power from the Wind" by Palmer C. Putnam, D. Van Nostrand Company, Inc, 1948.

George A. Jessop
Consultant
S. Morgan Smith Co
York, Pa.

Editor's Note: Electrical World acknowledges a first-class boner. Facts of the case, as reported in the April 7, 1945 issue and as stated by reader Jessop, are that "one of two 15,300 lb 87.5 propeller blades driving the 1,000 kw generator . . . was torn off as the result of a concealed crack near its root. At the time a southwest wind of 20 mph was blowing and the generator was delivering about 300 kw into the Central Vermont Public Service Corp system."

THE INDUSTRY FORECAST ISSUE

is coming Sept. 10

Help Needed Down Under

To the Editor:

I recently read a very interesting article entitled "100% Garbage Disposer Installation, etc" on pages 92-93 of the 25th September, 1950 issue of Electrical World.

Garbage disposal in Sydney, in particular, is causing a lot of trouble and I was wondering whether I could obtain details of the garbage disposer in question, costs and method of working.

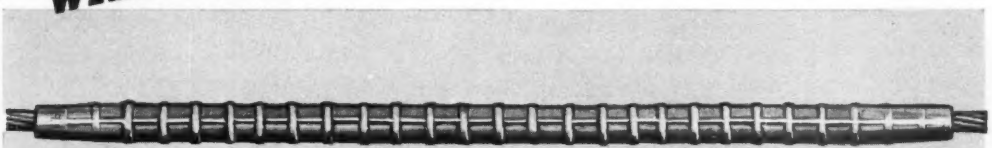
There are such items as tin cans, bones, tea leaves, paper, etc, to be contended with and it would be interesting to note how disposal was arranged . . .

L. E. Cooke
Box 1368, G. P. O.
Sydney, Australia

Editor's Note: We've promised reader Cooke that manufacturers of garbage disposers will come through with all the information he needs. Maybe we are overconfident!

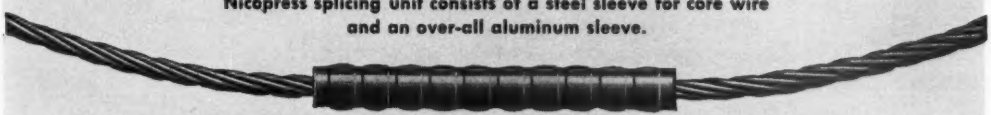
Nicopress SLEEVES for A·C·S·R·

WILL GIVE YOU PEAK PERFORMANCE!



COMPLETED LINE SPLICE

Nicopress splicing unit consists of a steel sleeve for core wire and an over-all aluminum sleeve.



COMPLETED JUMPER SPLICE

REPAIR SLEEVE
(Partially Completed)

Nicopress is the Registered Trade Mark of The National Telephone Supply Company

The National Telephone Supply Company

5180 SUPERIOR AVENUE • CLEVELAND 3, OHIO

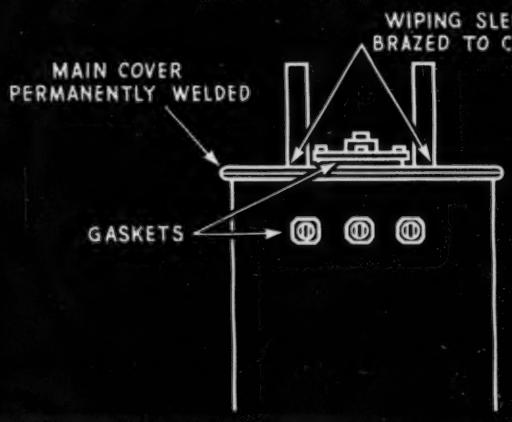
Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

IT'S A FACT:

SEALED CONSTRUCTION MAKES KUHLMAN SUBWAY TRANSFORMERS COMPLETELY SUBMERSIBLE



Sealed construction of the new Kuhlman Subway Transformer designs provide complete protection against the entrance of water and the corrosion of metal parts. This is an important item since these units are often completely submerged.

Covers are permanently welded to tank rim (bolted covers can be furnished at customer's option). Wiping sleeves are brazed to cover or terminal box. Moisture resistant gaskets are used for handhole covers, terminal box covers and secondary bushings. Tap changer outlets are protected by plugs. Cooling tubes, when used, are fitted snugly into holes in the tank wall and welded on the outside to insure strong water and oil tight joints and to eliminate moisture-holding crevices. A copper faced grounding pad is welded to the tank base.

These features, plus other important design changes including reduced cross-section for smaller manholes, conform to the recently announced EEI-NEMA Standards for subway transformers. Write for Bulletin CS-901, listing complete details on the new Kuhlman subway units.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN

K E